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ABSTRACT

Four studies report on the performance of fifth-grade child dyads and adult dyads on three problem-solving tasks, extending previous research on the structural properties of the communications and on factors influencing the accuracy of the communications. Aspects of performance investigated are: (1) relative participation of dyad members in the conversations, (2) mechanisms of the regulation and integration of verbal interaction, i.e., repetition and interruption, and (3) features of encoding style. The influence of subject characteristics, which include sex and race among the adult dyads and SES, sex and race among the child dyads, on these aspects of communication behavior were also examined. The results across the studies may be summarized as follows. The distribution of TVO between members of the adult dyads and the patterning of the verbal gestures of repetitions and interruptions support the view that mutually accepted rules of conduct underlie participant interaction in problem-solving communication. The behavior of the child dyads reflects partial acquisition of these rules, and child dyad performance is similar across SES, race and sex subgroups. No consistent SES, race or sex differences were found in encoding style. Thus, observed SES differences in communication accuracy among the child dyads could not be directly attributed to characteristics of encoding style. (Author)

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INVESTIGATION OF CHILD-ADULT DIFFERENCES IN PROBLEM-SOLVING COMMUNICATION

Catherine Garvey

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February 1972

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Abstract

Four studies report on the performance of fifth-grade child dyads and adult dyads on three problem-solving tasks, extending previous research on the structural properties of the communications and on factors influencing the accuracy of the communications. Aspects of performance investigated are 1) relative participation of dyad members in the conversations, 2) mechanisms of the regulation and integration of verbal interaction, i.e., repetition and interruption, and 3) features of encoding style. The influence of subject characteristics, which include sex and race among the adult dyads and SES, sex and race among the child dyads, on these aspects of communication behavior were also examined. The results across the studies may be summarized as follows. The distribution of TVO between members of the adult dyads and the patterning of the verbal gestures of repetitions and interruptions support the view that mutually accepted rules of conduct underlie participant interaction in problem-solving communication. The behavior of the child dyads reflects partial acquisition of these rules, and child dyad performance is similar across SES, race and sex subgroups. No consistent SES, race or sex differences were found in encoding style. Thus, observed SES differences in communication accuracy among the child dyads could not be directly attributed to characteristics of encoding style.

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Background

The studies reported here are a continuation of a project which has three major objectives. The first objective is the development of the concept of communication modes, that is, functionally and structurally different forms of conversational interaction. The second objective is the comparison of adult and child communication behavior, observed within a given speech situation and embodying a specific communication mode. The third is the investigation of the early stages of the differentiation of communication modes as an important aspect of the development of communicative competence in children.

The present studies are directed primarily at the second objective in that certain features of communication in a defined speech interaction (convergent communication) have been isolated and the patterning of these features examined in the speech behavior of adult and child dyads. No evidence is presented here for the hypothesized contrast between different communication modes, nor for the course of development of rules guiding conversational interaction in children of different ages. The work, however, concentrates on dimensions of communication which will subsequently be related to the first and third objectives listed above.

The first study examines the relationship between the relative amount of participation in conversations of a given type and the role or functions of the members of the dyad. The second and third studies describe the patterning of integrative and regulatory gestures in the conduct of conversations. In these investigations child and adult behavior is compared and evidence for effects of such dyad characteristics as race, sex and socioeconomic status (SES) among the child dyads is examined. The fourth study is addressed to the question of social class differences in encoding style and attempts to extend previous research findings to the speech of dyads engaged in problem-solving communication.

The several studies are based on a single corpus of speech elicited by three problem-solving tasks administered as a two-person communication game. Thus, the subjects, procedures and materials will be described at

the beginning of this report. Each single study contains only the specific procedures relevant to it, i.e., details of analysis and selection of subsamples from the corpus. References to previous reports resulting from this project are given in the method section below.

Method

Subjects:

Children: A sample of 96 fifth-grade children was selected from four public elementary schools so that it included equal numbers of Negro and white boys and girls from low and middle socioeconomic (SES) families. The sampling procedures employed census data, recent city surveys and parental response to letter questionnaires. The sample was further restricted to children of normal age-grade placement whose Kuhlmann-Anderson IQ scores were within a normal range (85-115). Twelve classmates within each sex, race, and SES group were randomly assigned to dyads. The 48 dyads performed the first task in October, 1969. The same dyads, with the exception of four replacement dyads, performed the second and third tasks two months later. The replacements were selected by the same criteria as were the original dyads. Observations on selected linguistic features of the speech of these subgroups were reported in Garvey & Dickstein (in press).

Adults: A sample of 48 adults was composed of paid volunteers, 12 males and 12 females from a predominantly black state teachers' college and an equal number of subjects from a predominantly white state teachers' college. Dyads from each college were composed of same sex, same race pairs whose schedules permitted them to attend the session at the same time. All three tasks were administered to an adult dyad at a single session.

Procedures:

Dyads reported to a room assigned by the school. Each member of the dyad sat at the opposite side of a table which was divided by a screen, so that members of the dyad could hear but not see each other. A white administrator of the same sex as the dyad read the instructions, repeating portions of the instructions as requested. The administrator then distributed

the task materials, subtask by subtask, and recorded the subjects' final choices or solutions. No information on the correctness of the solution was given to the subjects. All sessions were tape recorded, providing about one hour of recorded speech for each dyad. Between the administration of the first task and the second and third tasks, the adult dyads completed a family history questionnaire and a portion of an attitude scale. For the children, a warm-up session, a version of the game Password, preceded the first session.

All tasks were scored for accuracy from the completed task materials and from the administrators' record of choices. Adult dyads were highly accurate on all subtasks. Differences in accuracy among the child dyads were correlated with social class (middle SES dyads reached accurate solutions more often than low SES dyads), but not with race or sex. The variance in the children's accuracy scores was partially accounted for (44% of variance) by measurement of three communication components: orientation of Knower, communication of essential information, and verification of solution. Evidence of the success of the three tasks in directing similar behavior was of two kinds: 1) the consistency of the accuracy scores for children across the three tasks (K-R 20 = .72), and 2) the similar structuring of the verbal communications produced by the adult dyads.

All ten subtasks of the first task, two subtasks of the second and of the third tasks were transcribed in standard English orthography to which was added indications of pauses, interruptions and clause junctures. The transcription was supervised by a linguist. Transcriber consistency and agreement was checked. The total verbal output (TVO) produced by each individual for each subtask of each task was counted.

Materials:

Three tasks were developed to elicit problem-solving, or convergent, communication. Although the content of the tasks differed, all represented a situation in which two people can cooperate to exchange information in order to reach an explicitly stated goal. The two people together have sufficient information to solve a given problem, but

neither person is able to complete the task alone. The distribution of information and the activity required to complete the task creates two task functions. One function is that of Knower (K), who is cognizant of the final form of the solution. The other function is that of the Doer (D), who is aware of the problems which emerge in carrying out the solution and who has the responsibility of executing the solution.

Task I. In the first task one person was given an array of seven pictures; the other person received a single picture which was the same as one of the pictures in the array. The set of seven consisted of variations of one figure (an imaginary object or creature) which had four attributes which could be varied independently. The six figures differed from the single (correct choice) as follows: two combinations of four attributes differing from the single one on one dimension; two combinations differing from the single one on two dimensions; and two combinations which differed on three dimensions. Examples of the arrays presented to D are reproduced in the Appendix. In subtask 8, the correct choice, the single figure held by K, is the right-most figure in the second row. The critical attribute with correct dimension underlined, are: smooth or humped back; left-curved or right-curved tail; high or low position of head; short or long legs. This task requires the identification of those attributes and one of their two dichotomous dimensions which will, in combination, uniquely specify the correct figure within the array of figures. D holds the array, the specific context within which the object can be identified; K holds the figure which combines the unique selection of dimensions of the initial attributes. Such a task implies the notion of referring. Searle (1969) regards a referring expression as a description of an object which uniquely identifies that object within a specific context. We extend this concept to the results of the cooperative activity of the dyad in which the information required for solution is divided between the participants. Task I will be called a referring task. It will be seen that a referring task, although conforming to the definition of convergent communication as do Tasks II and III, requires a somewhat different

distribution of participant function and elicits somewhat different proportions of interactional gestures. Each dyad completed ten subtasks of Task I, each individual alternating five times as K and five times as D. The dyad's choice was scored for accuracy by counting the number of initial attributes the chosen and correct figure had in common.

Task II. K was given a complete wooden model of a molecule, D a partial model. D's task was to complete, from extra pieces (colored balls, short and long sticks, and springs) a model identical to that of K. A second subtask, involving a different molecule, allowed the individuals to change functions as K and D. Accuracy was assessed according to the number and color of balls and number and shape of bonds in the completed model.

Task III. K was given a map with a route drawn in from the starting point to the end point. D was given the same map without the route drawn in. His task was to draw the same route on his map. A different map was used in the second subtask in which the participants changed function as K and D. Accuracy was assessed by counting the number of correct corners included in the drawn route.

Both Tasks II and III will be called procedural tasks. In both, K must direct D to perform a sequence of actions (building or drawing). The primary direction of information flow is thus from K to D; however, D's account of his understanding, his problems, or his progress influences K's directions, from the beginning of each subtask to its end.

Instructions:

The administrator read to the dyad standard instructions which described the task. The subjects were told that they could communicate freely to accomplish the task, which would be completed when D had identified the single picture in his array, constructed a molecule identical to that of his partner, or drawn in the correct route to the end point of the map. On completion D was to indicate his choice or give his completed molecule or map to the administrator. No time limits or other restrictions were imposed.

More complete descriptions of the subject-populations, the task materials, and results of the accuracy analysis can be found in Baldwin & Garvey (1970). Techniques for describing the verbal communications are presented in Garvey & Baldwin (1970), and a comparison of child and adult communications in Garvey & Baldwin (1971).

Framework of the Analysis:

Not all features of the structure of the verbal communications are directly relevant to the present studies. A brief account, however, of the framework of the analysis and of the resulting description of the conversations will be helpful in understanding this report.

The discourse type is called convergent communication. Its structure results from the cooperative activity of two persons pursuing an explicitly stated goal in a situation in which the task information and activity required for the solution is complementarily distributed between the participants. Each complete transcription of a subtask of the referring and of the procedural tasks represents a token of this discourse type. Typical adult subtasks are differentiated into three stages; orientation, task conduct and closing. In the orientation stage, participants establish their common frame of reference and assign or clarify their respective functions. The task conduct stage is the actual working out of the solution. The closing stage occurs after the task operations are completed and may include terminal review, summary statements or evaluation of the previous activity.

An utterance by a participant is called an event; it may contain a single clause or clause fragment or several clauses or clause fragments The conversation, however, is viewed as a product of the dyad. Thus, the exchange, two sequential events, one from each participant, is the basic unit of analysis. Relations holding within the exchange between events or parts of events can then be identified. Briefly, exchange internal relations are of the type formed by a question and a response satisfying the question; a question and an appropriate (but not satisfying) response; a statement and an appropriate comment; a directive or a command and an appropriate question. An exchange of the last type in this non-exhaustive list is: A. Take a right, B. A sharp right?.

The occurrence of exchanges in sequence is patterned. Some groups of exchanges show a high degree of cohesion, and between such groups there is a break, a linguistic or thematic discontinuity. These groupings may be viewed as a conversational analogue of the paragraph. These groupings are called chunks, which are defined as a unit of content. The chunk is structured around a single major topic and is marked at its boundaries by verbal signals (lexical, grammatical or intonational or a combination of two or more such signals). The further structural analysis of the chunk identifies exchange groups and embedded exchange sequences. The exchange group is a sequence of exchanges in which there is continuity of form between two non-contiguous events produced by a single participant. The intervening event may be a continuative or an interrupted interruption from the other participant. The embedded exchange sequence is similar to a parenthetical insertion, which itself shows internal cohesion. If it is excised, however, an exchange internal relationship holds between the event preceding it and the event following it.

The following example of a chunk (excerpted from an adult transcript of Task III) will illustrate the terms thus far introduced. Events are numbered in sequence. An exchange is a combination of events or event components, e.g., exchange 15-16 is composed of the simple event 15 and part of the complex event 16, "okay--fine #." Exchange 16-17 is composed of the second part of the complex event 16, "so I take the curved /," and all of the simple event 17.

Chunk boundaries are indicated by a double slash (//). The beginning of a chunk is signalled here by a marker, "okay" or "now," as in events 9 and 19, respectively. A question mark (?) indicates a question, identified either by intonation or word order. The double bar (#) indicates any clause final juncture except that of rising intonations. Thus, in event 14 the sequence, (? #), indicates that the event is a question (a component of the disjunctive question begun in event 12) and was produced with a final, falling intonation contour. The single slash (/) indicates that the event was interrupted, i.e., event 13 was begun while the speaker of event 12 was still talking.

The example contains an exchange group (exchanges 12-13 and 13-14) in an embedded exchange sequence (exchanges 12-13 through 15-16):

//

9) okay you're on the street where the truck is #

10) okay #

11) okay take that until you hit the next intersection and following that intersection up--take the curved part rather than the straight part #

12) okay this intersection that I'm at--this the intersection right above the trees?/

13) un huh #

14) or next to the Gino's #

15) right above the trees #

16) okay--fine # so I take the curved /

17) take the curved section #

18) okay #

19) all right # // now when you get off the curved section # I want you to take the road that goes straight to the flag #

The internal organization of the chunk is related to the treatment of its topic or theme, which may be described as follows. The theme is first established. In the example above a precondition for establishment of a theme was given in event 9 and confirmed in event 10. The theme, which may be paraphrased as "Take the street where the truck is to the next intersection and follow the curved section up," is contained in event 11. The embedded exchange sequence (exchanges 12-13 through 15-16) is a segment which serves to clarify one component of the theme, i.e., "which intersection." If excised the theme of the chunk remains the same. The resolution segment of the chunk begins with exchange 16-17 and concludes with exchange 18-19. A new chunk begins with the second part of the complex event 19. Note that the embedded exchange sequence itself has a theme which is subordinated to the major theme of the chunk, a precondition to that theme, and a resolution segment (first part of event 16).

The adult communications were remarkably similar in the degree to which the orientation and closing stages were present and the degree to which precondition of the theme and the resolution segments were overtly marked. The children's communications revealed similar patterning but were less consistent in marking these features of organization of the discourse. Other measures of the content type and behavior type of events produced similar results (Garvey & Baldwin, 1971); the adult dyads exchanged more messages concerned with 1) the evaluation of information and 2) the acknowledgement of message reception than did child dyads.

The results of the previous studies of the speech of child and adult dyads performing the three problem-solving tasks may be summarized as follows:

The regularities of the adult behavior permitted a description of a discourse type. The structural features of this type provided dimensions on which adult and child communications in this speech situation could be compared. The comparisons support the notion that children of this age level have acquired some, but not all, and have acquired only to some degree, the complex behaviors common to adults in this mode of interaction.

Middle SES children were more successful than low SES children in achieving accurate solutions to the tasks, and this advantage was, in part, ascribed to behaviorally-defined cognitive factors (Baldwin & Garvey, 1970). However, in respect to the formal organization of the discourse described above, no consistent SES, race or sex differences were present among the child dyads.

1. Relationships among Speaker Function, Communication Mode and Relative Amount of Participation

The determinants of relative amount of participation in communication situations have been studied primarily in small groups (Stephen & Mishler, 1952; Bavelas et al., 1965) or in two-person interview situations (Saslow & Matarazzo, 1959). Although individuals are believed to show some stable characteristics in act-rate and amount of action, relative amount of participation in the interview by an interviewee can be affected by the duration of the interviewer's speech. Matarazzo et al. (1963) suggested a "verbal interaction constant" of 5(interviewee) to 1 (interviewer) measured in duration of speech of the interview situation. This effect may be related to the organizational properties of the interview itself. Examining duration of participants' speech in unstructured (but topic-oriented) conversations on three occasions, Feldstein (1968) found that the relative duration of utterance was reliably constant across the occasions and that a ratio of one speaker to the other was approximately 1 to 1. Within the unstructured conversation, however, length of utterance of one participant (number of words per utterance) was not reliably related to that of the other.

These studies do not directly question the influence of interaction mode or type on relative amount of particpation, whether the latter is measured in duration or in amount of speech in words (total verbal output). Goffman (1955) has pointed out that the rules of talk pertain not to spoken interaction as an ongoing process, but to an occasion of talk as a naturally bounded unit. The unit is the total activity "accredited" or legitimized by the official participants who maintain a single (sometimes moving) focus of attention. However, occasions can be grouped into types according to the properties of their components (Hymes, 1968). According to sociolinguistic theory, a given speech situation is characterized by occurring properly in a setting and at a time, is structured in respect to the participant roles and reciprocal functions and obligations of those roles, and shows certain selectional rules governing topic. Thus, to use Ervin-Tripp's (1969) example, a class at a university is a situation. The setting is a scheduled time and place, the

participants are students and an authorized instructor. The functions of the personnel and the relevance of topics are recognized by the participants. Either a lecture or a seminar discussion is the normal speech event in this situation. The event itself is structured into stages, and exhibits internal sequencing rules. Furthermore, the event selects from the repertoires of the participants' speech styles appropriate to the situation and to the specific event (lecture or less formal discussion) and, we suggest, the appropriate type and amount of participation. For examples of studies of speech events following this general framework, see Blom and Gumperz (1968) and Frake (1964).

A somewhat different emphasis focuses on the process and purpose of interaction rather than on such components as setting, channel, time. Watson and Potter (1962) have proposed a distinction between task-centered interaction, which shows locomotion toward a goal, and social interaction, which deals with elaboration of conversational resources. In the latter the display, maintenance and development of personal identity is paramount. Moscovici (1967) suggests that speaker function is in part defined by one of two possible purposes: to maintain or change behavior of the listener or to maintain or change the relationship of speakers. The different functions require different strategies and impose certain restraints on speakers which affect the communication system--specificially the organization of messages. McGuire & Lorch (1968) examine rules for talk which obtain in specific interactional modes of dyadic communication of which they list associational, problem-solving, interrogation and clarification of misunderstanding. McGuire & Lorch do not discuss how such modes would relate to speech events occurring in the socially identified context of a speech situation. However, the congruence of a given mode with types of speech events appropriate to certain speech situations is presumably recognized by competent speakers within a speech community. Garfinkel (1967) has provided some evidence of the strength of reactions to use of modes inappropriate to a situation or differing from the events expected in a situation. We will use the term communication mode to refer to the shared complex of rules underlying the spoken interaction in an occasion of talk.

Relative amount of participation can be viewed in this framework as being directed by mode rules which identify the functions of the participants and structure their verbal and nonverbal interaction. The interview, the social conversation, or the problem-oriented discussion should be regulated by different rules for relative amount and type of participation. Rules for relevance of evidence, for speaker-switching, for degree of redundancy are also expected to differ according to the mode adopted. In the problem-solving communication mode, or convergent communication, the organization can be referred primarily to the information-related functions of the participants and to their mutual recognition of and joint obligations to pursue a goal or solution. If such properties of speech events are important determinants of relative amount of participation in unrestricted communications, then adult members of the same speech community should be expected to show the same relative amount of participation according to participant function. That is, the speaker in a given function should exhibit greater regularity in amount of participation than the speaker as individual (whose characteristic verbosity or reticence would be affected by his function in the interaction). If it is true that children only gradually acquire the adult rules for interrelating their performances, then their relative amount of participation would be less well predicted from their participant function than that of adults. The children in the present study range from 10-12 years of age. In other measures of conversational cohesion they fail to exhibit an adult level of consistency (Garvey & Baldwin, 1971). There is reason to expect that mode rules for participation are also not yet fully developed for all child speakers.

The problem-solving mode and the tasks employed in this study show a differentiation of participant function. Both participants have accepted the task goal and cooperate to approach it. However, the initial distribution of information differs from task to task. Informational or cognitive demands of the task must influence relative participation to some degree. Problem-solving communication presupposes that the participants cognize a strategy which takes into account the initial distribution of information and its necessary direction of flow. We are assuming, however,

that the adoption of a strategy and its consistent execution is influenced by mode conventions. The participants, having agreed tacitly or explicitly to adopt a strategy, have apportioned the functions of the realized mode, and their subsequent behavior is constrained by the rules for those functions. Individual loquacity, or aggressiveness or reticence, would also be constrained by function requirements. Thus, the communication can be viewed as a field of tensions. The cognitive requirements, the individual behavior patterns, and the interactional conventions for the mode may all influence the relative amount of participation and the distribution of task work. We have not manipulated these three factors independently. However, some attempt is made to identify their influence in determining the patterning of relative amount of participation in the tasks examined.

Results

The data consist of the total verbal output of 48 adults and 96 children performing the several subtasks of the three communication tasks. Child dyads were grouped according to SES (Low, Middle), race (Black, White), and sex (Male, Female); adult dyads were grouped according to race and sex. Thus, there were 12 groups of subjects. The mean TVO and standard deviations for the 12 groups are presented, by task, in Table 1. Although the low SES white male children (LWM) produced less TVO for all three tasks, not race, nor sex, nor SES consistently predicts TVO for the child dyads. Among the adult dyads, however, greater TVO is associated with race, the black adults consistently producing greater TVO on all tasks. Inspection of the standard deviations for each group indicates greater variability in TVO among the child dyads than among the adult dyads.

Table 1

Means and Standard Deviations of TVO
by Task for All Dyads

TASK	ADULT[a]				CHILD[b]							
	WM	WF	BM	BF	MBM	MBF	LBM	LBF	MWM	MWF	LWM	LWF
Task I (10 subtasks)												
Mean	1250	1002	1514	2056	1154	1449	1202	1346	1182	1016	711	1633
S. D.	459	369	544	137	632	739	754	1031	480	427	186	780
Task II (2 subtasks)												
Mean	1057	1276	1790	1664	1032	1166	1684[c]	1268	971	1622	429	422[d]
S. D.	231	555	520	494	475	898	499	751	472	1359	450	336
Task III (2 subtasks)												
Mean	1235	1260	1807	2236	1560	1265	1105[d]	1075	1318	2538	801	587
S. D.	239	288	453	605	618	735	710	379	485	1202	500	334[c]

[a] N= 6 dyads per subgroup

[b] N= 6 dyads per subgroup except as noted

[c] N= 4 dyads
[d] N= 5 dyads
} (remaining dyads, of 6, did not speak during task)

The distribution of TVO by Knower (K) and Doer (D) functions was then examined in each of the tasks and subtasks in each subgroup. At this point no predictions were made about the influence of specific strategies and the analysis was directed toward uncovering any consistent patterning of relative participation within a task. Proceeding by task, the relative participation of K and D was calculated for each subtask. Subtasks in which K and D produced the same amount ($\pm$ 10 words of speech) were identified as balanced distributions and excluded from the count of speaker-differentiated subtasks. Then, the percentage of the remaining subtasks in which K-TVO exceeded D-TVO was calculated. Figure 1 represents the percentage of the subtasks in which K-TVO exceeded D-TVO for each subgroup in Task I. Figure 2 represents the same data for Task III. In these two tasks, the majority of subtasks shows greater amounts of TVO produced by K than by D among the child subgroups and among the adult subgroups. Only the LWM

and LBM subgroups failed to differentiate relative participation in the majority of subtasks of Task II. However, comparison of child and adult percentages of subtasks shows that more of the adult dyads conform to the pattern K-TVO exceeds D-TVO. Combining these two similarly patterned tasks, the ratio of K-TVO to D-TVO for adults (raw scores) is approximately 2:1 (white adults 2.1:1; K 20,208, D 8,839; black adults 1.7:1; K 28,664; D 16,239). For the child dyads the ratio is 1.7:1; (K 66,669, D 40,005).

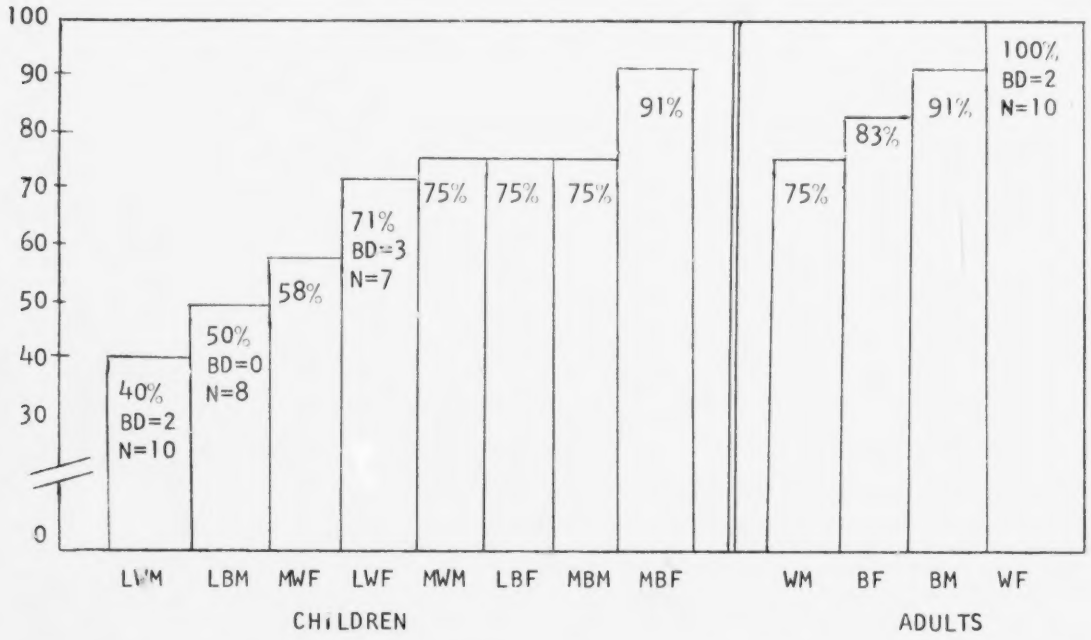

Figure 1. Percentage of subtasks in Task II in which K-TVO exceeds D-TVO. Note:

Number of subtasks for each group is 12 except as noted, where N=number of subtasks (excluding balanced distributions) and BD=number of subtasks with balanced distribution. Where BD + N≠12, incomplete date (i.e., poor recording, no talk) necessitated deletion of subtasks from the group.

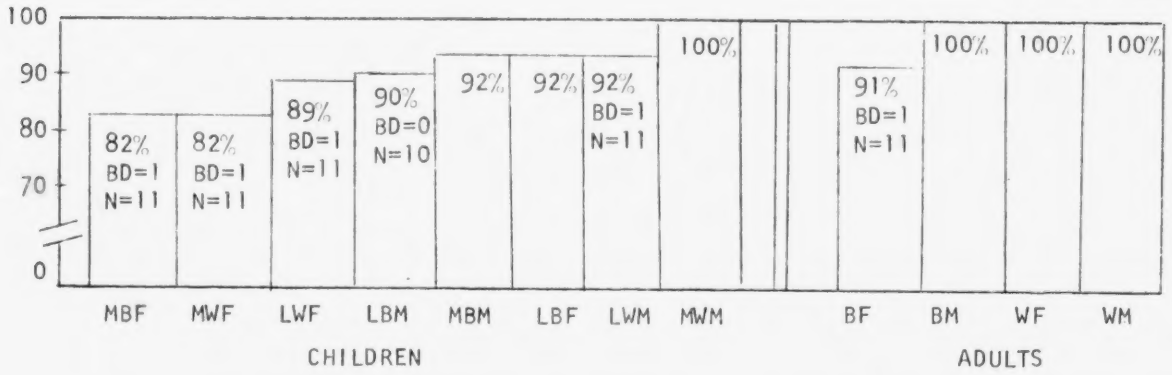

Figure 2. Percentage of subtasks of Task III in which K-TVO exceeds D-TVO. Note: Number of subtasks for each group is 12 except as noted, where N=number of subtasks (excluding balanced distributions) and BD=number of subtasks with balanced distributions. Where BD + N≠12, incomplete data (i.e., poor recording, no talk) necessitated deletion of subtasks from the group.

On these two tasks, the distribution of information is such that K holds the information about the form of the final solution, i.e., the shape of the complete molecule or the course of the correct route. His work is to direct the activity of D, to communicate the steps leading to the solution of the task. But D participates actively. Doers typically question messages they consider unclear, anticipate directions, try to provide K with information about their position or understanding of the task, as well as providing feedback at frequent and regular intervals during K's presentation. For all adult dyads and for most child dyads, it is the K function which dominated the task. What is surprising is the degree to which D participates. Figure 3 presents a sample of an adult, white, male dyad in a portion of Task III (map). The variety and frequency of D response is typical of the adult dyads.

(Figure 3)

D	K
	23) then you make a right onto that road #
24) all right make a right #	
	25) until you get to that first intersection #
26) that little line there? #	
	27) yeah--it connects it to--take that up #

28) yeah #

29) then make another--a left #

30) make a left?

31) yeah #

32) all right #

33) all right--follow that until you get to that sign or whatever it is #

34) railroad crossing sign?

35) yes--and then you can go up that--not the far one but the one in the middle #

36) yeah--go up the middle line #

37) past the factory #

38) take a right onto the line?

39) yeah #

40) past the factory you take a right onto that line?

41) right #

42) all right #

Figure 3. Excerpt from Task III (adult, white, male dyad)

We cannot isolate the relative effects of cognitive, individual, or mode influences in these two tasks. However, it would be difficult to account for the frequency of subtasks in which K-TVO exceeds D-TVO if individual talkativeness were the major factor, since it is K rather than the specific individual whose relative TVO produces these results. It would be difficult to account for the high proportion of D participation if the distribution of task information determined the relative amount of participation. The Doer's participation, as illustrated in Figure 3, is highly cooperative, but also highly redundant in respect to the factual information conveyed. These results on the relative amount of participation in the two tasks indicate that adult dyads consistently pattern their activity according to their function in the interaction. Child dyads exhibit somewhat less consistency in relative distribution of participation according to function. Further, this mode seems to require a distribution of relative participation which differs from interactions observed in interview situations in which the interviewee-interviewer ratio of relative

duration was 5:1 (Matarazzo et al., 1963) and from unstructured, but topic-oriented conversations (Feldstein, 1968) in which the distribution was 1:1.

Figure 4 presents for each subgroup the percentage of subtasks in Task I in which K-TVO exceeded D-TVO.

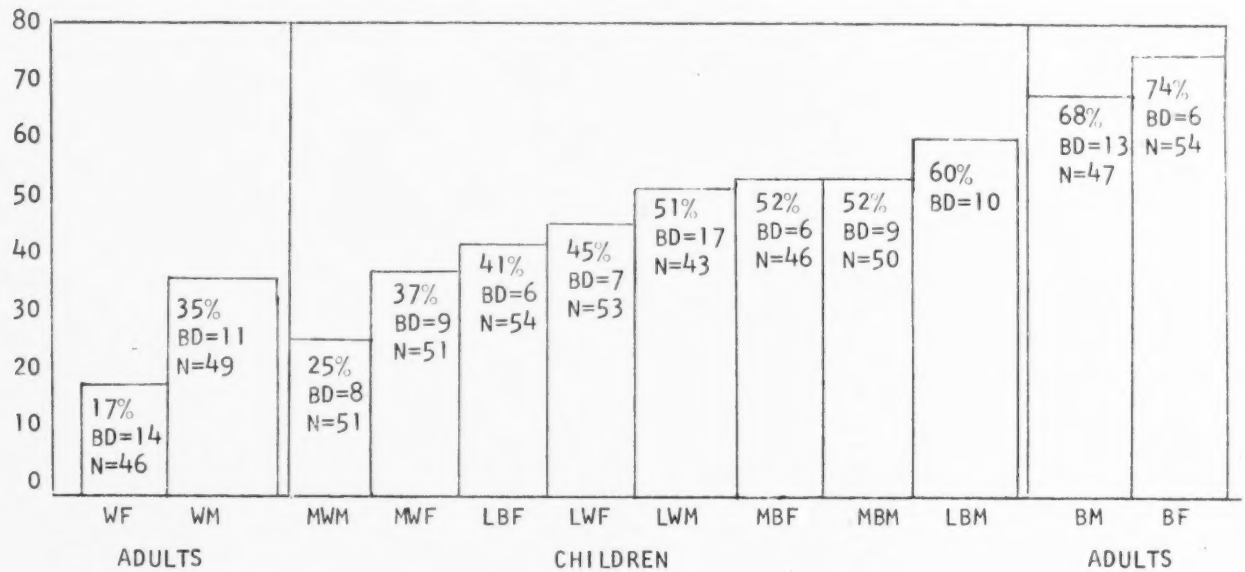

Figure 4. Percentage of subtasks in Task I in which K-TVO exceeds D-TVO. Note: BD=number of subtasks with balanced distribution of speech. N= number of subtasks (excluding balanced distributions) Where BD + N≠60, incomplete data (i.e., poor recording, no talk) necessitated deletion of subtasks from the group.

For the black adult subgroup (male and female combined) K-TVO exceeds D-TVO in 71% of the subtasks. For white adults (male and female combined) a very different pattern is apparent. D-TVO exceeds K-TVO in 74% of the subtasks. The child subgroups show a considerable range. In general, the black child dyads resemble the black adult pattern, and the white child dyads resemble the white adult pattern. With the exception of the MWM and MWF subgroups, however, the child dyads reflect a relatively even balance between K and D dominance in relative participation. The mean percentage of subtasks in which K-TVO exceeds D-TVO for all child dyads is 45%. The ratio of K-TVO to D-TVO (raw scores) for Task I is as follows:

	K	D	
Black adults:	1.3:1		(K 12,018; D 7,818)
White adults:	1:1.4		(K 5,780; D 9,359)
Children:	1:1.4		(K 27,099; D 29,806)

It is apparent that the white adults have adopted a different strategy for the performance of the referring task, whereas the performance of the black adults resembles their performance on the other two tasks. Task functions are differentiated in a majority of all adult subtasks; however, blacks tend to allot task dominance to K, whites to D. Although the ratio of K-TVO to D-TVO shows that the child dyads permit some differentiation of participation of speakers in this task, the analysis of participation by subtask shows no strong preference in the children for consistent patterning of relative participation.

From the consideration of the initial distribution of information and the optimal strategy for reaching a solution, Task I differs from Tasks II and III. In Task I, D can see the display of seven figures, can identify the critical attributes and their dimensions. Although K can describe his single figure in detail, he does not know what attributes of his figure are critical. The more efficient procedure would seem to be for D to ask questions which systematically eliminate variations of the figure. That is the strategy followed by the majority of the white adult dyads. The black adult dyads prefer a strategy in which K describes his figure in detail, followed in many cases by D's questioning or checking on the critical attributes. In order to confirm the relationship of these strategy differences to TVO, the percentage of attributes initially mentioned by D was correlated for each dyad with the raw TVO for each subtask. The correlation was significant ($r=.42$, $p < .05$) for the adult dyads, suggesting that this strategy was more efficient, i.e., that dyads in which D asked K for a decision on each critical attribute completed the task with a lesser amount of speech. The relationship between this measure of strategy and TVO for the child dyads was not significant, however. This finding suggests that factors other than strategy play a greater role in influencing TVO among the child dyads.

We have assumed that the different patterns of relative participation between the black adult dyads and the white adult dyads reflects a different realization of the mode conventions for problem-solving communication in this task. White dyads have consistently chosen an efficient strategy, black dyads have been equally consistent in adopting a relatively less efficient strategy to solve tasks with the same initial distribution of information. All adult dyads achieved accurate solution.

A further analysis was undertaken to weigh the relative effects of individual behavior patterns of talkativeness and of conformity to the empirically determined, preferred strategies of these two groups. A measure of talkativeness was derived for each individual by summing his TVO in both K and D functions in the subtasks of Tasks II and III combined. This measure identified the more talkative individual of each dyad. The white adult strategy for Task I allows D to dominate the task. Thus, each subtask of Task I was examined to determine whether the more talkative individual conformed to the group convention, i.e., moderated his TVO when functioning as K, in relation to the TVO of D. For example, in the dyad 201-202, individual 202 produced greater TVO across both functions in Tasks II and III. If 202 spoke less as K than his partner did as D in a subtask of Task I, the dyad was said to conform to the mode conventions dictated by the group's preferred strategy; the subtask was rule-governed (R). If, in the K function 202 spoke more than D, the subtask was governed by 202's individual behavior (T). If the less talkative member, 201, exceeded the TVO of 202 when 201 was K, the influence cannot be identified, but may be suspected to be informational or cognitive (O). When 202 spoke more as D, this could be attributed either to rule or to behavior pattern, but no decision could be made (R + T). Balanced distributions were also counted. The same procedure was carried out for the black adult dyads, but the rule convention was reversed, i.e., that group's preferred convention allows K to dominate the subtask. Thus, the more talkative individual would be expected to moderate his TVO when functioning as D. The results of this analysis are presented in Table 2.

Table 2

Distribution of Task I Subtasks for White and Black Adult Dyads by Predictors of Relative Participation

Item	White Dyads	Black Dyads
Predictor:		
Rule (R)	29	30
Individual (T)	20	19
Rule and Individual predictors coincide (R + T)	41	42
Other (O)	5	10
Balanced subtasks	25	19
Total[a]	120	120

[a]12 dyads x 10 subtasks = 120 subtasks for each group.

The influence of individual talkativeness is clear in only one-sixth of the subtasks. Clear evidence of conformation to the group's preferred strategy is present in one-fourth of the subtasks. Rule and individual talkativeness coincide in one-third of the subtasks. Other influences (O) are not strong, but balanced subtasks (subtasks in which participant function was not clearly differentiated) account for a little more than one-sixth of the subtasks. What is most striking about this analysis is that the relative participation of both the white and black groups, although their apparent strategies are quite different, is shown to be subject in the same way to the various influences governing distribution of participant function.

For most of the child subgroups no clear strategy prediction could be made and thus, this analysis was not performed for the children as a group. However, since the analysis of subtasks indicated that the middle SES white male and female children exhibited a pattern similar to that of the white adults, the predictors of relative participation were examined for the subgroup of white female children. (Presence of a replacement dyad among the white male dyads in Tasks II and III made it impossible to determine individual talkativeness for one dyad of the white males.) Table 3 presents a comparison of this analysis for white adult females and middle SES, white, female children.

Table 3

Distribution of Task I Subtasks for White Adult Females and Child Middle SES White Females by Predictors of Relative Participation

Item	Adult (WF)	Child (MWF)
Predictor:		
Rule (R)	17	13
Individual (T)	7	12
Rule and Individual (R + T)	21	19
Other (O)	1	7
Balanced subtasks	14	9
Total	60	60

The similarilty of the two groups confirms the observation that MWF children were following the same mode convention for relative participation in the task as white adult dyads. Individual talkativeness appears to influence participation somewhat more for the child dyads than for the adult, and clear evidence of operation of the preferred strategy rule is somewhat less. In both groups, however, one-fourth of the subtasks show influences unaccounted for by the rule of the mode convention (R) or individual talkativeness (T).

Summary

Relative participation measured by TVO of members of child and adult dyads was examined across three problem-solving tasks in which, by cooperatively pursuing an explicit goal, participants could allot their respective activity to differentiated task functions. It was assumed that adult dyads would display consistent behavior in respect to their relative participation according to task functions. If so, this consistency could be interpreted as reflecting the influence of rules which guide this mode of conversational interaction.

The specific mode under consideration, problem-solving, would be expected to differ from other modes such as the interview on a number of dimensions of which relative participation of members of the dyad

is one. It was predicted that, if the rules for interaction are learned, then the child dyads might exhibit less consistency in relative participation according to task functions in this conversational mode. Relative participation for all groups was hypothesized to be a complex function of the rules for mode conventions, individual behavior patterns (talkativeness) and the cognitive or informational requirements of task performance.

The individual subject in a dyad alternated in the two task functions (Knower or source of information; Doer or person responsible for executing solution) in subtasks of each of the three tasks. The tasks were examined for relative participation of the two functions. In Tasks II and III all dyads allotted the major amount of participation to the Knower function rather than to a given individual. The relative participation of the Doer function was high, indicating that active cooperation, rather than passive reception of information is characteristic of the problem-solving interaction of these procedural tasks. Child dyads, however, conformed to the adult pattern (K-TVO > D-TVO) in fewer of the subtasks of Tasks II and III.

In Task I, a referring task, black adult dyads followed the same pattern as in Tasks II and III. White adult dyads reversed the pattern to given the major amount of participation to the Doer function, a strategy which correlated with increased efficiency. Within both adult groups, however, participant functions were differentiated to approximately the same degree with active participation from the non-dominant function. This result suggest that the same mode conventions may result in superficially different strategies in different socially defined groups and that studies of verbal interaction should attempt to examine similarities.

In Task I child dyads tended to produce the same pattern of relative participation as their same race-sex adult counterparts. Again, however, in more subtasks the child dyads failed to differentiate participation between the two functions.

Finally, black adult and white adult dyads were compared (Task I) on the extent to which relative participation in each subtask could be predicted by mode conventions or individual talkativeness or by other influences. By assuming that each dyad conformed to the mode convention

unique to its group, it was found that both groups' patterns reflected approximately equal influences on relative participation. This finding supports the validity of the proposal that mode conventions, individual behavior patterns and cognitive requirements all operate in influencing relative participation in problem-solving communications.

Only one child subgroup (MWF) was compared to its adult counterpart, (WF) in this analysis. These child dyads, though somewhat less influenced by mode conventions, showed a similar interaction of influences on relative participation.

II. Mechanisms of the Regulation of Conversation: Repetitions

This study will examine some of the mechanisms by which the flow of conversation in dyadic communication is regulated and integrated. Although there has been little discussion of what classes of mechanisms should be distinguished and how these classes might work, the existence of regulative and integrative gestures in dyadic communication has frequently been noted. Joos (1962) postulates a predictable rate at which the addressee contributes feedback gestures in "consultative style," and Scheflin (1968) suggests a class of "integrational signals" which operates to coordinate the interlocutors' participation.

The results of the study of relative participation supported the idea that speaker function in a task influences the relative amount of participation of the speakers, moderating individual behavior patterns. In all tasks, and in the procedural tasks especially (Tasks II and III) the proportion of Doer TVO seemed to exceed that minimally necessary for successful completion of the tasks. Both speakers, actually, devote a number of events to messages that neither present new information nor search for new information, but which serve the process of information transmission or reception. These messages represent management (M_1) content (manipulation of persons or objects, e.g., "Hold it...wait a minute."; "This stick doesn't fit right."), metacommunicative (M_2) content (at[illegible]t precision, recoding, e.g., "Well, not exactly a sharp curve, more curvy like."), or a category of content which includes signals of message and evaluation reception (M) such as continuatives, e.g., "Yeah," "Okay," and repetitions.

The average number of events per chunk in Tasks II and III was 6.2 for adult dyads. The average number of M-events per chunk in Tasks II and III was 1.1. Thus one-sixth of the events of each chunk was devoted to signals of message reception. Such regulative verbal gestures seem to be characteristic of oral problem-solving communications and probably account, in part, for the large number of messages employed in spoken

communications as opposed to communications via other channels such as handwriting or typewriting (Chapanis, 1971).

Repetition of a preceding utterance by a speaker appears to play an important part in integrating the flow of conversation. Repetitions (as a subclass of M-events) were selected for more detailed analysis. Only exact verbatim repetitions of a part or whole of a preceding utterance were included in the analysis. The count is a conservative estimate of how much one speaker repeats another's speech, since many utterances incorporate all or part of a preceding utterance but modify it in some way, e.g., A. So it has knobby knees. B. Well, it has sort of knobby knees.

Repetitions were classified as follows:

1. Form of repetition:

C--Verbatim repetition of a complete immediately preceding clause.

C+--Verbatim repetition of a complete immediately preceding clause with additional material added outside the repeated clause, e.g., A. It has feathers. B. It has feathers--Well, okay.

PE--Verbatim repetitions of the end of a preceding clause, e.g., A. It has feathers. B. Feathers.

PO--Verbatim repetition of some part other than the end of an immediately preceding clause, e.g., A. It has feathers on each wing. B. Has feathers.

Repetitions were further classified as to form as a) explicit questions (Q), i.e., marked by question intonation or question word, or as b) non-questions, or confirmatory statements (S).

Answers to questions which duplicated the form of the question were excluded from the count since the answer form, although subject to variation in extent of ellipsis, could be considered to be determined by the question form, e.g., A. Should I make a left? B. Yes, ~ Yes, a left. ~ Yes, make a left. ~ Yes, you should make a left.

2. Context of repetition:

The utterance was classified as search for information (S), presentation of information (P) or evaluation of information (E).* These categories reflect the intent of the speaker as he performs his particular participant function in the problem-solving communication.

3. Consequence of repetition:

The utterance following the repetition was examined to determine whether the repetition was explicitly acknowledged (A) or not acknowledged (NA). If the speaker who produced the repetition continued talking, the consequence was speaker continues (NASC). In this case the repetition was not acknowledged, but under the specific circumstance that the speaker did not pause or wait for acknowledgement of his repetition.

The following examples illustrate the coding categories:

A. what about his feet. are they black or white?

B. they're white #

B. white # unh--what about the ears #

Partial-end (PE); Confirmatory Statement (S); Context of Presentation (P); Consequence: Not acknowledged--speaker continues (NASC).

- -

A. would you say his left ear is bigger than his right?

B. gee, I don't think so--they're about the same size #

A. they're about the same size?

B. un huh #

Complete (C); Question (Q); Context of Presentation (P); Consequence: Acknowledged (A).

- -

*These categories employed in previous studies are described in detail in Garvey & Baldwin, (1970).

A. the stripes are red? B. the stripes?

A. yeah, around his body #

Partial-other (PO); Question (Q); Context of Search (S); Consequence: Acknowledged (A).

- -

A. put a peg on top of this black atom # B. black atom #

A. right # it's got one hole left #

Partial-end (PE); Confirmatory Statement (S); Context of Presentation (P); Consequence: Acknowledged (A).

Repetitions, as defined, were tallied for Task I and for Tasks II and III combined. Missing data due to poor recording reduced the number of child dyads in Task I from 48 to 46. In Tasks II and III those dyads (2 low SES black and 3 low SES white and 1 middle SES black) who failed to produce at least 30 exchanges on any single subtask were eliminated. Thus, only 42 child dyads are represented in the analysis of Tasks II and III. Although this procedure may have reduced the differences between the child and adult groups as a whole, it seemed preferable for the present analyses to include only those child dyads whose verbal interactions were fluent and unconstrained. The raw scores of repetitions for each dyad were divided by the number of exchanges produced by the dyad to give a percentage of exchanges containing a repetition. Table 4 presents the means and standard deviations of exchanges containing repetitions for the child and adult dyads for Task I and for Tasks II and III combined.

Table 4

Means and Standard Deviations of Exchanges Containing Repetitions for Child and Adult Dyads

Task	Child	Adult (N=24)
Task I	M .02 (N=46) SD .02	M .07* SD .03
Tasks II & III	M .04 (N=42) SD .02	M .04 SD .01

*$p < .01$ (by a t-test)

The percentage of exchanges containing repetitions is significantly greater for adults than for children in Task I, although in Tasks II and III the percentages for children and adults is the same, 4%. There was somewhat more consistency in its use among the adult dyads. No adult dyads failed to use repetitions in each task. However, 10 child dyads did not use repetitions in Task I and 2 child dyads failed to use repetitions in Tasks II and III. Post-hoc comparisons of the adult dyad subgroups revealed no differences between the sex or racial subgroups. Among the child dyads sex and race comparisons were also non-significant. More low SES child dyads produced repetitions of their partner's speech than did middle SES child dyads ($X^2 = 5.5$; df = 1; $p < .05$) in Tasks II and III, but not, however, in Task I.

These results indicate that repetition of a partner's utterance was a relatively stable feature of problem-solving communication in the two types of tasks examined, although adults tended to use this gesture more frequently in the referring task. It is, of course, only one type of dependency by which cohesion is achieved, but it is a gesture which many of the child dyads utilized.

The results of subsequent analyses are consonant with the results presented above. In general, children 10-12 years old use this gesture in a manner very similar to that of adults.

1. Form of repetition:

The distribution of repetitions by form is shown in Table 5.

Table 5

Percentages of Repetitions by Form Classifications for Adult and Child Dyads

Form	Adult Dyads	Child Dyads
Partial-end (PE)	34%	35%
Partial-other (PO)	19	28
Complete (C)	28	24
Complete + (C+)	18	10
Total	99%[a]	97%[a]

[a]Unclassifiable repetitions reduce the total percentages from 100%. Slightly fewer of the child dyads' repetitions could be classified in these categories.

Both adults and children produced more repetitions which duplicated only a final portion of the repeated clause: 35% of all repetitions were classified as Partial-end (PE). This result may reflect the fact that in an analysis of theme-rheme components, the rheme tends to occur toward the end of the clause in English. (For the relation of repetitions to the presentation of information see section 2 below.) Both child and adult dyads show a rather similar distribution of form types. Inspection of the form of repetitions within dyads shows that variety of form is preferred, i.e., no dyad uses one form exclusively in any task.

Repetitions in question form (Q) made up 48% of the child dyads' repetitions and 31% of the adults'. In only a few cases could the question-form repetition be interpreted as a genuine request for information resulting from mis-hearing or misunderstanding. Rather, the question-form repetition appears to be a variant of the statement-form or confirmatory repetition, even though it is more likely to be acknowledged. (See section 3 below.)

2. Context of repetition:

Most repetitions (94% adult; 90% children) occur after the presentation of information (P). In the procedural tasks (II and III) the repetition occurs most generally after an unsolicited presentation; in the referring task (I) after a solicited presentation (an answer to a question). Thus, the repetition, when it occurs, appears to serve to confirm new information as it is presented.

Example: (After a solicited presentation of information)

A. is the mouth open or closed?

B. closed #

A. it's closed--okay #

Example: (After an unsolicited presentation of information)

A. then you go past the factory #

B. past the factory #

A. yeah # you'll see another street #

3. Consequence of repetition:

Adults tended to acknowledge a repetition more often than children: 64% of adult repetitions and 56% of children's repetitions were explicitly

acknowledged. There were no significant differences among the child subgroups, but black adults tended to acknowledge repetitions more often than did white adults (black adults, 72%; white adults, 52%).

Of those repetitions which were not acknowledged, the majority were cases in which the speaker continued talking (adults, 23%, NASC). Thus, only 13% of all adult repetitions were not explicitly acknowledged if the speaker's partner had the opportunity to respond. For the child dyads the percentage is similarly low (15%, NA), although somewhat more instances of speaker continuing without pause for response occurred among child dyads (29%, NASC).

If a repetition was encoded in question-form, it was likely to be acknowledged. Of 218 repetitions in question-form only 4 were not acknowledged among the adult dyads; among the child dyads 19 out of 281 question-form repetitions were not acknowledged. In a few cases the speaker who produced the question-form repetition did not pause for acknowledgement, but continued talking. Adult dyads produced 12 such cases, child dyads 48.

Acknowledgement of a repetition contributes further to the number of messages in problem-solving conversations which are concerned with the process of communication, i.e., messages devoted to the reception and confirmation or evaluation of other messages.

A methodological point should be made here. In a previous study (Garvey & Baldwin, 1971) a content-function type was set up (M-events) and its various formal manifestations identified. The class of M-events included many of the forms classified here as repetitions. M-events were defined as a content category. M-events showed referential function only secondarily, if at all, and were, in addition, frequently further classified in the behavioral coding as representing reception and/or evaluation. In the present analysis, the verbatim repetition of a clause or clause fraction was examined; thus, a verbal gesture was defined according to form. In the formal analysis, only slight differences were found between adult and child groups in respect to repetitions. In the previous functional analysis significant differences were obtained in each task with adults exceeding children in use of M-events. The difference in the two analyses may simply reflect the frequency of other items classed

as M-events, i.e., continuatives or other feedback gestures. It is possible to speculate, however, that certain formally recurrent gestures such as repeating a clause or clause fraction may be well-learned by children before the functional classes of interactive behaviors are fully developed and employed at the adult level of consistency.

The results of this examination of verbatim repetition in problem-solving communication can be summarized and evaluated as follows.

1. Verbatim repetitions of a part or whole of a speaker's utterance occur regularly and consistently in the referring task and in the procedural tasks of this sample of problem-solving communications. Adult dyads are more consistent in the use of this verbal gesture than are child dyads, but no consistent sex, race or SES differences appear across tasks.

2. The form of a repetition varies among the four major categories (Partial-end, Partial-other, Complete, Complete +). Preference for repetition of the end of a clause is common to both child and adult dyads. Since repetition of a complete clause is also frequent, the repetition form is apprently not determined solely by the position of theme or rheme (or topic or comment) in the repeated clause. Each dyad displayed variety in form of repetition.

3. Most repetitions occur after an event which presents information. This fact confirms the impression that the function of the repetition in problem-solving communiction is to acknowledge or confirm the transmission of Information. The cooperative activity requires that both partners are not only aware that a message has been sent, but that it has been received in good condition.

4. Adult dyads acknowledged repetitions somewhat more often than did child dyads. Frequently the speaker who produced the repetition paused and received some confirmation of his repetition. That the majority of repetitions were acknowledged in the succeeding event confirms the importance of the function of this gesture to both participants.

We can conclude that repetitions in problem-solving communication serve not only to signal the reception of information (primarily after

presentation of information) but are a means by which participants integrate their ongoing interaction (acknowledgement of repetitions). Children 10-12 years old have achieved a nearly adult level of the use of this gesture. It is interesting to note that children's repetitions, although encoded more often in question form than are adult repetitions, resemble in form and variety of form those of adults. The regularity of this patterning adds to our understanding of the complexity of what it means to use language.

This study, as those previously reported, reveals no differences among sex, race or SES groups of children in respect to this feature of interactive communication.

III. Mechanisms of the Regulation of Conversation: Interruptions

In normal fluent conversation speakers frequently interrupt each other. Goffman has postulated that a turn at speaking is continuously in progress--so that there is a tacit understanding at any point as to which participant holds the floor. Interruptions and simultaneous talking have been viewed as temporary breakdowns in the alternation of turns. Duncan (1970) observing the operating of floor-yielding cues in face-to-face interview found that when several cues (including syntactic, paralinguistic, lexical, kinesic and intonational cues) were simultaneously displayed, the percentage of simultaneous talking declined.

Little is known about how interruptions are distributed within a discourse, nor whether they serve any function or functions, or should be viewed simply as breakdowns in floor apportionment, random noise, so to speak, in the conversation. In dyadic problem-solving conversation the cooperating participants apportion the task functions in the exchange of information which leads to the solution. Further, the pacing of the conversation seems to be continuously subject to regulation, as the changing needs of each participant are expressed and accommodated. In addition to regulation of the information exchange, there appears to be a continuous signalling of active participation and of attention by ritual gestures of involvement in the interaction. Interrupting may not so much indicate a breakdown in the smooth apportionment of turns at speaking, but may be a means by which participants regulate the process of information exchange, and perhaps, also display the degree of involvement required by the problem-solving mode. If interrupting should prove to be patterned in respect to participant function or to the progression of task information, then it may be considered, not as noise, but as an integrative gesture in normal dyadic communication.

Interruptions (instances of simultaneous talking or of partial overlap of speech) were indicated in the transcribed scripts by a slash (/). In an overwhelming majority of instances it was possible to identify events

as interrupted or interrupting, i.e., to ascribe responsibility to one or the other participant. The sample included the transcripts of 46 child dyads in Task I and 42 child dyads in Tasks II and III combined, and 24 adult dyads in Task I and Tasks II and III combined (see p. 28). The number of interruptions for each dyad was divided by the number of exchanges produced by that dyad to give a percentage of the exchanges in which an interruption occurred. Table 6 presents the means and standard deviations of exchanges which contained interruptions in adult and child speech.

Table 6

Means and Standard Deviations of
Exchanges Containing Interruptions for Child and Adult Dyads

Task	Child		Adult (N=24)
Task I	M .07 SD .09	(N=46)	M .13* SD .06
Tasks II & III	M .08 SD .05	(N=42)	M .12* SD .04

*$p < .01$ (by a t-test)

Adult dyads exceed child dyads in interruptions in both types of tasks, and the differences between the groups is significant in both types of tasks. The two adult groups are remarkably consistent across tasks (Task I: black adults, 13.3%, white adults, 12.5%; Tasks II and III: black adults, 13.3%, white adults, 11.7%). These results indicate that the rate of interrupting is reasonably stable for adults. In no adult dyad in any task did the speakers fail to interrupt each other. The child dyads were less consistent. In Task I, four dyads failed to interrupt at all and an additional nine dyads interrupted less than four times. In Tasks II and III, eight child dyads failed to interrupt at all in at least one task and an additional 11 interrupted less than four times. These facts suggest that interrupting should not be considered solely as an indication of a breakdown in the mechanisms that integrate communications. Comparison of the child subgroups shows no significant differences attributable to race, sex or SES in use of this gesture within either type of task.

A sample of eight adult dyads (two male and two female dyads of each race) and 16 child dyads (two male and two female from each race and SES group) was randomly selected for closer study of the function of the interruptions and their distribution. Both subtasks of Tasks II and III were analyzed. Task I was excluded from this examination since the conventions for distribution of participant function differed between the black and white adult dyads, and in many cases were not consistent among the child subgroups.

Interruptions were classified according to 1) which participant produced the interrupting event, 2) the relation of the interrupting event to the pacing of the information exchange process, and 3) the relation of the interruption to the apportionment of the floor.

1. Interruptions classified by participant:

An interruption was attributed to the participants, A or B, according to the logical pattern of participant function, i.e., A is the participant who should, considering the initial distribution of information, dominate the interaction if the goal is an efficient solution. In the procedural tasks (II and III) A was the speaker (Knower) who held the completed map or model; B was the Doer, the speaker who had to construct the missing part of the model or to draw the correct route on the map.

2. Interruptions classified by regulating function:

Many interruptions appeared to play a part in pacing the flow of information. The interrupting speaker attempted to speed up or slow down the progress of the communication, or he interrupted with a continuative. This last type of interruption (e.g., "Yeah", "Okay", "Gotcha") seemed to indicate that the pacing was satisfactory.

a. Accelerating (+)

Accelerating interruptions serve to advance the mutually shared information. In form, these interruptions often complete the interrupted clause by adding a component which may be a clause, phrase, or lexical item, e.g.,

A. okay; now you bear left just as you /

B. get to the church #

A. yeah #

Participant: B; Function: +

- -

A. how are the eyes made? are they like /

B. they're like tear drops #

A. all right #

Participant: B; Function: +

- -

Accelerating interruptions may also introduce an independent construction, e.g.,

A. take the first left #

B. is it the one /

A. look--proceed to the stop sign #

Participant: A; Function: +

- -

b. Decelerating (-)

Decelerating interruptions do not advance the mutually shared information but serve rather to check or modify previously presented information. They are often structurally related to a clause immediately preceding the interrupted clause, e.g.,

A. slow down--turn where you see this sign at--and go over there to /

B. what sign?

A. the stop sign #

Participant: B; Function: -

- -

They may be directly related to the interrupted clause, e.g.,

A. alright now--and you come up /

B. come back you mean #

A. come back towards yourself #

Participant: B; Function: -

- -

Decelerating interruptions may also be unrelated to the interrupted event as is the first interruption in the example below, which explicitly requests review.

A. the two springs are attached to the red balls so that /

B. hold it--wait a minute--go back to the blue ball and /

A. to the blue ball--good grief #

Participant: B; Function: -
Participant: A; Function: -

- -

c. Continuative (OK):

A. make a line like the length of the two trees and /

B. right #

A. and then you follow that line til you get to one--what looks like one of them water storage places #

Participant: B; Function: OK

- -

3. Interruptions classified by relation to floor apportionment:

Not all interruptions could be clearly identified as pacing interruptions. Three additional categories were set up to accommodate the following observations, all of which relate more to the conduct of the interaction than to the progress of task information.

a. Noise (N) resulted when two or more interruptions occurred in immediate succession. These instances were few, but they clearly represented failures to successfully apportion the floor; e.g.,

1) A. then look for a longish stick /

2) B. long or short? there's no /

3) A. you need /

4) B. (Unintelligible)

Event 2. Participant: B; Function: -
Event 3. Participant: A; Noise
Event 4. Participant: B; Noise

- -

b & c. Shift (S) or Unsuccessful Shift (US) resulted when the interrupting speaker either took or attempted to take the floor by force.* Such a move could be explicit as when A successfully reclaims his directing function:

*These categories were coded separately, but since they were few in number, they were combined in the analysis.

B. from that point I have to go /

A. no--listen--I'll tell you # you cross a bridge right?

B. yeah #

A. and then you come to an intersection #

Participant: A; Shift

- -

An unsuccessful shift is illustrated in the example below in which event 2) is subsequently interrupted by A who refuses to relinquish his function:

1) A. set the model up so it's facing /

2) B. boy this is wild--mine won't stand /

3) A. make it face you # okay?

Event 2. Participant: B; Unsuccessful Shift
Event 3. Participant: A; Shift

- -

Results of the analysis of the participant function responsible for the interruption in the procedural tasks are presented in Table 7. Adult dyads are presented separately by race to show the similarities between two subgroups.

Table 7

Percentages of Interruptions by Participant Function in Tasks II and III

Participant	Child Dyads (N=16)	Black Adult Dyads (N=4)	White Adult Dyads (N=4)
A (Knower)	36%	42%	41%
B (Doer)	63[a]	58	57[a]

[a]Where percentages fail to total 100%, 1% and 2% of the interruptions could not be assigned to a single participant.

For all three subject groupings, B, the Doer, is responsible for the majority of interruptions. Further examination of the subgroups showed that all adult dyads conformed to this patterning of interruptions when the four subtasks (two in Task II, two in Task III) were combined. Four of the eight adult dyads failed to follow this pattern in one of the four subtasks;

two dyads in two of the four subtasks. Three of the 16 child dyads departed from this pattern (B interrupts more than A) in at least one subtask.

The relation of the interrupting event to the pacing of the transmission of information and to floor apportionment in Tasks II and III is presented in Table 8, in which the percentages of each category are again presented for three groupings--children, black adults and white adults.

Table 8

Percentages of Interruptions by Pacing Categories and by Floor Apportionment Categories (Tasks II & III)

Category	Child Dyads (N=16)	Black Adult Dyads (N=4)	White Adult Dyads (N=4)
Pacing:			
+	37%	46%	45%
-	28	24	19
OK	8	18	22
Apportionment:			
Noise	10	4	5
Shifts	11	7	5
Unassigned	6	1	4

As in the analysis by participant function, the two adult groupings are quite similar. For all adults and for the children, the majority of pacing signals are accelerating, i.e., the interrupting speaker advances the progress of information exchange. The higher proportion of accelerating interruptions among adult dyads may reflect more adequate encoding of information within the adult dyads. Adults retard the flow of information about as often as they approve the ongoing rate. Either the pacing of information within the child dyads is less often satisfactory or the child speaker tends not to acknowledge a satisfactory rate of transmission when it occurs.

This analysis shows very little noise in the conversations, a situation which resulted when a speaker refused to yield to an interruption and interrupted the interruption, or when two speakers briefly continued talking at the same time. In view of the fact that only auditory

cues were available to the speakers (who were separated by a screen) the low percentage of noise suggests that the function of kinesic cues in face-to-face interaction is either relatively redundant, or that their content has been effectively transferred to the vocal channel in this speech situation. Similarly, the relatively small proportions (lower for adults than children) of interruptions in which a speaker took or attempted to take the floor by force reflect the smooth operation of the conventions for floor apportionment in these procedural tasks.

Task I, the referring task, was shown in Part I of this report to result in less clear-cut differentiation of speaker functions as measured by relative TVO of the participants. It would, therefore, be expected that interruptions attributable to floor apportionment problems might be more frequent in a task in which participant function was less distinctly distributed. The last six subtasks of Task I from the same small random sample of subjects (comprising eight adult dyads and 16 child dyads) was examined. Table 9 presents the results of this analysis of Task I. Black and white adult dyads have been combined since the number of interruptions in this sub-sample was small.

Table 9

Percentages of Interruptions by Pacing Categories and by Floor Apportionment Categories (Task I)

Category	Child Dyads (N=16)	Adult Dyads (N=8)
Pacing:		
+	20%	44%
-	21	17
OK	4	12
Apportionment:		
Noise	13	5
Shifts	36	21
Unassigned	6	1

Child dyads used a considerably smaller proportion of interruptions to pace the flow of information in Task I (45%) than in Tasks II and III (73%). Pacing interruptions are somewhat less for adults in Task I (73%)

than in Tasks II and III (86%). Both groups, however, produce more instances in Task I which appear to reflect floor apportionment problems. In Task I 49% of the children's interruptions reflect noise or shifts as do 26% of the adult interruptions. There seems, then, to be some relationship between clear-cut distribution of participant function and the function of the interruption.

In summary, this study of the distribution and function of interruptions reveals consistent patterning of this verbal gesture.

1. Adult subgroups were remarkably consistent in the distribution of interruptions between participants, and child dyads reflected the adult pattern, i.e., the Doer interrupted more than the Knower.

2. Although the nature of the task, procedural or referring, had an effect on the functions of the interruptions, it appeared to be possible to distinguish two major functions: pacing and floor apportionment. Again, adult subgroups were very similar in their use of interruptions to accelerate, decelerate or assent to the pacing of information. Across all tasks interruptions indicating floor apportionment problems were fewer for adults than for children. The high proportion of noise and shifts in Task I (for both children and adults) indicates that less clear-cut differentiation of participant function results in an increase of such interruptions.

IV. Subcultural Differences in Encoding Style

Observations of subcultural differences in children's communication behavior have variously been related to 1) their social antecedents, 2) their place in a language system within a speech community, or 3) their consequences to the outcome of an interaction. The first type of relationship is best illustrated by the work which draws on the Bernstein hypothesis concerning elaborated and restricted language codes, which emerge from person-oriented or status-oriented family structures and socialization practices (Bernstein, 1962; Hawkins, 1969). The second approach, which seeks to identify linguistic correlates of social differences, focuses on the systematic nature of linguistic variation--on how linguistic variables are distributed throughout a community and how they may function in the differentiation of the community (Labov, 1966, 1968; Wolfram, 1969). The third approach is exemplified in studies which relate accuracy or comprehensibility of verbal communication behavior to social class (SES) or race differences (Krauss & Rotter, 1968); Carson & Rabin, 1960). The latter approach has been particularly liable to the criticism that observed SES and race differences in communication behavior may reflect differential contextual constraints on performance rather than differences in underlying cognitive or linguistic competence (Cazden, 1970). Also, certain findings of subgroup superiority in communication behavior may lack generality, e.g., the findings from one task may not hold when the task is modified in some way. For example, the solutions of middle-class child dyads were more accurate than those of lower-class dyads and those of white dyads more accurate than those of black dyads in a picture-identification task* (Baldwin, McFarlane, & Garvey, 1969). In model-building tasks and map-tracing tasks administered later to the same dyads the race effect was not replicated, although the SES effect was (Baldwin & Garvey, 1970).

A recent study by Heider (1971) adds an important step to the identification of subcultural differences in communication by attempting to relate

*The picture-identification task (Task I) is a "referring" task. The model-building task (Task II) and map-tracing task (Task III) are "procedural tasks." These terms were defined on pages 4-5 above.

specific features of encoding style to the outcome of a communication. Accuracy of decoding was examined as a function of two "stylistic" dimensions of the encodings. Encoding style was defined by identifying encoding units as 1) either inferential or descriptive and as 2) either wholistic or analytic. Within a sample of 10-year old children, Heider found that middle-class and lower-class encoding styles were reliably different. Although both groups of children used a whole-inferential style, it was this style which was preferred by the lower-class children (79% of encodings). The middle class children used a part-descriptive style in 53% of their encodings. Highly significant differences were also found in the number of units produced. Middle-class children produced more images (i.e., said more different things about the figures) than did either lower-class white or lower-class black children.

A similar distinction of style (which was not, however, linked to decoding accuracy) was suggested by Brent and Katz (1967) who identified a geometric as opposed to a metaphoric mode of reference in the communication of white college freshmen and inner-city Negro youths, respectively. Brent and Katz and Heider treat these differences as evidence of preferred styles elicited in the given communication situations. Heider points out that the origin and meaning of the part-whole and inferential-descriptive preferences in coding style remains an open question. Nevertheless, these studies imply a possible parallel between these encoding features and features of cognitive style. These styles were, in part, at least, associated with superior middle-class performance in decoding.

If these observed features of encoding style reflect stable differences in the cognitive styles of middle and lower-class children, then we would expect to find similar distinctions in the encodings of the middle and lower-class children in Task I in the present studies. If such differences obtain, they might account, in part, for the greater number of accurate solutions achieved in this task by the middle-class and by the white subgroups of dyads.

The purpose of this study, then, is to examine the transcripts of child and adult dyads for evidence of reliably distinct preferences in encoding style and, should such exist, to examine their relationship to communication

accuracy. This study is not a replication of Heider's procedures, but rather an independent examination of the concept of encoding style as defined in her research. Since we might expect that task effects (interaction requirements and stimulus materials) could influence style of encoding, it will be necessary to compare Heider's procedures with ours in some detail.

Method:

Subjects: Heider's (H) subjects were 143 ten-year-old children: middle-class white--23 boys, 21 girls; lower-class white--25 boys, 27 girls; lower-class Negro--24 boys, 23 girls. Middle-class status was defined as professional occupation of caretaker. Lower-class status was defined by residence in a government housing project. A middle-class Negro group was not available.

The 96 subjects in the present study were described on page 2 above. The sample included equal numbers of boys, girls, white, black, middle and lower-class subjects (12 children in each of 8 subgroups). From a demographically selected sample, status groups were further selected by use of parental responses to letter inquiries about occupation of head-of-household. Using the Hollingshead occupation scale, low SES was assigned to the three bottom levels(skilled, semi-skilled or unskilled worker); middle SES was assigned to levels four and above (owners of businesses, executives, managers, professionals). Twenty-four white adults and 24 black adults, each group composed of 12 males and 12 females, were paid volunteers from predominantly white and predominantly black teachers' colleges, respectively.

Stimuli:

H's stimuli were five arrays of abstract figures,* which have elsewhere been shown to elicit low agreement in what they are "named." The figures are reproduced in the Appendix (page 73). The stimuli for the present study were arrays 5, 6, 7, 8, 9, 10 of Task I subtasks (presented in the Appendix). These figures are less abstract than Heider's. They may be "named," but there was some lack of agreement among the subjects on 1) whether a distinguishing name was given and 2) what distinguishing name was given. For example, array #5 elicited from 12 adult subjects

*H's study also used a contrasting type of stimulus materials, drawings of faces. Since she found no significant interactions between stimulus types and encoding styles, we will limit our comparisons to the abstracts only.

the following designations: it (3x); my figure (1); this little creature (1); centipede (2x); centipede or whatever (1); caterpillar (2x); animal (1); insect (1).

Procedures:

The communication situation differed considerably in the two studies. H's subjects received an array with the target figure below the others in the array. "The subject was told to describe the target so that any other boy or girl his age could pick out that one just from what he said about it if it was mixed up with all the others. The subject was prompted once to say more if he stopped after uttering only one 'unit' of encoding, a procedure which received use almost exclusively with the lower-class subjects. Test sessions were tape-recorded." (Heider, op. cit., p. 35) Thus Heider's communication situation was a simulated one. In the present study the members of a homogeneous dyad (same SES, race, sex) were separated by a screen. They were told that they could talk freely so that the holder of the array could choose from his array the same single figure held by his partner. H's subjects did not receive any feedback after completing their encoding and the subjects of the present study were not told whether their choices were correct or not. In both studies the administrator was white and middle class, although in the present study the sex of the administrator was the same as that of the dyad being tested.

Coding:

The present study followed the same coding procedures described by Heider. Units of encoding, which were defined as a single "image" about the cue stimulus, were identified. Each image was classified on two dimensions: a) Part - Whole. A part unit was an utterance which referred to a part of a stimulus figure, a whole unit to the entire figure; b) Inferential - Descriptive. An inferential unit was an utterance that went beyond the "givens" of the stimulus to describe a figure by metaphor or simile. A descriptive unit described the physical properties of the figure in non-inferential terms.

Each dyad (subject, in H's study) then received five scores: 1) number of units, 2) percentage of those units which were whole and inferential (WI),

3) percentage which were whole and descriptive (WD), 4) percentage part and inferential (PI), and 5) percentage part and descriptive (PD). Interjudge agreement measures for the present study were similar to those reported by Heider, ranging from .84 to .100 across dyads for the style coding. Correlation between two judges' codings of number of units per dyad was examined separately and was also high ($r = .98$). Coders were instructed to indicate any unit which they felt could not be coded with confidence. Only an average of .1% of adult units and .25% of the child units were so indicated. Examples of units and their code categories are given below, with further comments on the coding conventions adapted to the characteristics of dyadic conversation, of which the most important are the presence of questions, answers, and comments (in contrast to Heider's corpus consisting primarily of statements). The figures (reproduced in the Appendix) to which these images refer are given in the left margin, the code in the right.

Figure	Unit	Code
Subtask 7	what I have here looks sort of like a camel with a curly tail	WI
Subtask 8	now here I think it's a lady bug--I'm not sure	
Subtask 7	two feet like a human	PI
	it's sort of shaped like a bean or something--it's body	PI
	how about the head, is the head right side up?	PD
	he's facing left	WD
	the whole, you know--the whole thing is curvey	WD
	A. okay is the head up or down?	PD
	B. straight--straight horizontal	PD

Disjunctive questions were coded as containing two units, e.g., the images are 1) head up and 2) head down. B's answer in the preceding example did not accept one of the disjunctive alternatives but presented a new image. Thus "straight horizontal" was coded as a separate unit. If the answer had been either "up" or "down," no new unit would have been coded. Similarly, with answers to yes-no questions or to content questions no new unit is coded if the answer adds no additional image to that of the question but rather completes it, e.g.,

Figure	Unit	Code
Subtask 9	A. is the mouth open?	PD
	B. no	--
Subtask 8	A. how many legs?	PD
	B. eight	--

If a new image is presented in answer to a question, it is, of course, coded as a separate unit, e.g.,

Figure	Unit	Code
Subtask 6	A. is the feet colored in?	PD
	B. no, they're empty	PD

Repetitions of a just preceding unit are not coded, e.g.,

Figure	Unit	Code
Subtask 6	A. the ears are round	PD
	B. round--okay	--

It should be noted again that scores were assigned to the dyad in this study rather than to individual subjects. A unit could be ascribed in most cases to an individual member of the dyad (except when interruptions distributed an image over both speakers, e.g., A. the figure/ B. looks like a beetle = 1 unit, WI). The participants, however, necessarily influenced each other in the use of the stylistic features. If one subject proposed a wholistic image, which was accepted by the other participant, then both could subsequently adopt terms appropriate to the accepted image. Certainly, the distribution of stimulus materials in a given subtask would supposedly make it more likely that the participant who held the complete array (D) would generate the majority of images. However, not all dyads adopted the same strategy in respect to which participant initiated mention of an attribute. (See Section I.) Furthermore, subjects alternated as K and D, and, thus, all subjects were, theoretically, equally represented in the summed scores for the dyad.

Results:

The five scores for each dyad, summed across the six subtasks, were grouped according to subject characteristics, i.e., children and adults; adults: white/black; male/female; children: middle SES/low SES; white/black; male/female. The mean scores for these groupings are presented in Table 10.

Table 10

Means of Encoding Style Variables

Variables	Subject Characteristics of Dyads						
	Age	Race		Sex		Social Class	
		B	W	M	F	MSES	LSES
a. No. Units	Adult	85.6	64.3*	74.7	75.2	----	----
	Child	77.4	66.0	68.2	75.1	70.6	72.8
b. % PI	Adult	13.0%	14.5%	12.0%	15.5%	----	----
	Child	13.3	12.5	13.5	12.2	15.2%	10.5%
c. % PD	Adult	77.7	77.5	79.5	75.5	----	----
	Child	78.0	79.8	79.3	78.0	76.9	80.8
d. % WI	Adult	6.5	5.5	7.0	5.0	----	----
	Child	6.2	4.8	5.3	5.8	4.5	6.5
e. % WD	Adult	3.0	2.0	1.0	4.0	----	----
	Child	2.4	2.8	1.8	3.8	3.3	2.3

*$p < .01$, df = 23 (by a t-test)

Comparisons of the means of the subgroups on number of encoding units shows only one significant difference. Black adults exceeded white adults in number of images produced ($p < .01$). This result is reasonable, given the TVO of the two subgroups (see Section I). Although the mean number of encoding units for the black child dyads exceeded that of the whites, the difference was not significant. The means of the MSES and LSES child dyads were very similar.

Heider's results were quite different. The mean of the total encoding record of middle-class subjects differed significantly from both lower-class means and was more than twice as large as either. For five arrays, Heider's middle-class subjects produced a mean of 21 encodings. The mean of lower-class white subjects was 8.7 and that of the lower-class blacks 8.9. The mean number of images of units produced by child dyads for the six subtasks in the present study was 71.8, i.e., an average of 11.9 units per subtask. It is likely that the cognitive requirements of this task (identification of the critical attribute) or the interactional requirements (dyadic

conversation), or both, contributed to the large number of units produced per array. It is not clear, however, how these factos could so completely suppress the tendency observed by Heider for middle-class subjects to produce a larger number of images in describing the figures. Since Heider's observed social-class differences were proportionally similar for both types of her stimuli (abstracts and faces), the less abstract character of the imaginary creatures used in this study as compared with Heider's more abstract figures would not, in itself, provide an explanation of these results.

As to the means of the encoding style variables (% PI, PD, WI, WD), no significant differences appeared between children and adults or between subgroupings of child dyads or subgroupings of adult dyads. The lower-class preferences for whole-inferential encodings observed by Heider was not found, rather the majority of encodings of all subjects was part-descriptive: the mean percentage of PD encodings for all dyads was 78.8%, the percentages of other style categories were also similar across groups. For all groups combined the mean of the part-inferential encodings was 13.3%, of whole-inferential 5.8%, and of whole-descriptive 2.6%. Table 10 shows minimal divergence from this mean for any subgroup of dyads. These results are consonant with Heider's in showing no strong effects for sex or for race.* The effect of social class which she observed, however, was not present among the subjects in this study.

Difference in the physical characteristics of the stimuli may account for the differences in the overall proportion of style categories. Whole-inferential encodings were relatively rare in the present study for all dyads, whereas for H's subjects they are more frequent (middle class 27.7% WI, lower class 79% WI). In both studies, however, percentages of part-inferential encodings were approximately the same, and whole-descriptive encodings were also similarly rare. A possible reason for the failure of Task I to elicit differences among dyads in encoding style is that such differences might appear only under a condition which encourages or permits inferencing about the characteristics of whole figures. If this were so, it would still not be clear why this condition should affect social classes

*It should be remembered that in Heider's study comparisons on race were made among lower-class subjects only.

differentially, i.e., would cause the use of WI encodings to increase among lower-class subjects in Heider's study more than among the middle-class subjects.

A multivariate analysis of variance was performed in order to determine more precisely whether any preferences in encoding style existed among the dyads of the present study.* This analysis indicated that there was a small but significant effect of social class ($p < .03$). An examination of the univariate tests indicated that the major contribution to this effect came from the PI and PD variables, with a higher percentage of PI encodings among the middle-class dyads and a higher percentage of PD encodings among the lower-class dyads. Re-examination of the means of these groups presented in Table 10 shows that this difference contributes very little to the overall configurations of the style variables across the subgroups of child dyads.

In the second stage of her study Heider asked subjects to decode the previously recorded descriptions of the figures and then scored the accuracy with which an encoding led to an accurate choice from the array. She found that middle-class encodings were better understood than lower-class encodings and that middle-class decoding performance was superior to lower-class. These effects could not be attributed to number of units. The middle-class style of composite encodings (containing units in both WI and PD styles) was the best understood kind of encoding across class of encoder and decoder. However, no direct relationship was demonstrated between encoding style and decoding accuracy, since with number of units and type of units held constant, middle-class encodings were decoded more accurately than lower-class.

Although the results reported thus far reveal only minimal social-class differences in the defined variables of encoding style, it is possible that some relationship may exist between these style variables and measures of communication accuracy. Middle-class and white dyads in the present study did perform the picture-identification task more accurately than did lower-class or black dyads and this result was in part explained by the middle-class and white superiority in explicitly encoding information about

*The author wishes to thank Dr. Doris Entwisle and Dr. Roger Webb for their advice and assistance in preparing this analysis. Dr. William Kurtines also assisted in this analysis and deserves special thanks for his comments on the manuscript.

the four critical attributes of each figure (Baldwin & Garvey, 1970). But could features of the style variables contribute in any way to the communication accuracy of an individual dyad?

Accuracy scores from the six subtasks were correlated with each of the defined style variables for each child dyad. As Heider found, number of units did not show any significant correlation with the accuracy scores. Accuracy scores for the dyads correlated positively ($r = .29$, $p < .05$) with the percentage of part-inferential encodings and negatively with the percentage of whole-inferential encodings, ($r = -.29$, $p < .05$). Accuracy scores were not, however, significantly related to the percentage of part-descriptive encodings. A second examination of accuracy scores and the combined percentages of part encodings (PI and PD) and of the wholistic encodings (WI and WD), respectively, produced no significant correlations. In this task, then, the more successful dyads tended to use a higher percentage of part encodings which were inferential, that is, descriptions of parts of the figures which invoked a metaphorical comparison. The analysis of variance did show that the middle-class mean for PI encodings exceeded that of the lower-class mean, by a small but significant degree, but there is little evidence to suggest that encoding style as here defined was an important factor in allowing the middle-class dyads to achieve more accurate solutions in the picture-identification task. Furthermore, although Heider's findings suggest that encoding preference for PD style is correlated with total decoding accuracy, here there was a slight tendency for more successful dyads to be those who included more PI encodings in their communications.

Comparing the present results with those of Heider's, it seems reasonable to conclude that clear evidence of social-class differences in encoding style as here defined may be restricted to specific stimuli and specific interactional situations. In communicating about the figures in this picture-identification task, members of homogeneous dyads did not display clear differences in encoding style, either in respect to the number of images or in respect to preferences for part or whole or inferential or descriptive images. Assuming the reliability of the coding

system, which was acceptable, and given the consistency of the overall configurations of the style variables across all dyads in the present study, what other factors could account for the discrepancy of these results from Heider's? There is the possibility that the social classes of Heider's subjects were more extremely differentiated. This seems unlikely in view of the fact that both studies showed comparable differences in communication accuracy between social classes. Perhaps the inclusion of middle-class black children reduced the social-class differences as analyzed in the present study. To check this possibility the means of the encoding style variables were re-examined, excluding middle-class black dyads. Middle-class white dyads were compared with lower-class white and black dyads, respectively, on percentages of PI, PD, WI and WD.

Table 11

Means of Encoding Style Variables for
MSES White, LSES Black and LSES White Child Dyads

Variable	Child Dyads		
	MSES White	LSES Black	LSES White
No. Units	67.5	81.1	64.5
% PI	15.5%	11.5%	9.5%
% PD	77.0	79.5	82.5
% WI	4.0	7.5	5.5
% WD	3.0	3.0	2.5

This analysis, presented in Table 11, produced a slightly higher percentage of PI encodings for middle-class white dyads than for either white or black lower-class dyads and thus is consistent with the finding of a positive relationship between PI encoding and accuracy scores in this task. The resulting percentages of encoding types, however, remain approximately the same for these three subgroups when the middle-class black dyads are excluded. Thus, the inclusion of middle-class black dyads in the present study does not account for the discrepancy between the two studies.

One further observation on the distribution of wholistic encodings in the picture-identification task is of interest. WD and WI encodings were rare, they accounted for only 8.5% of adult encodings and 8.1% of child encodings. The coding records showed that these WI and WD encodings tended to occur primarily at the beginning of each subtask. For adult dyads 67% of all WI and WD encodings combined occurred within the first two exchanges of each communication. This pattern occurs, but to a somewhat lesser degree, in the communications of the child dyads where 50% of all WI and WD encodings are found within the first two exchanges of each subtask.

In this task, then, wholistic encodings appear to serve an orienting function, by which the participants mutually agree on an image or term from which subsequent part (inferential or descriptive) images may be derived. An example from array #10 will illustrate this function of wholistic encodings. Speaker A (here the Knower) produces the first image, which is whole-inferential, "It's shaped like a star." B accepts this image, "Yeah, okay." A continues with a part-inferential image which builds on the first wholistic image, "The four points are the arms and legs." The rest of the communication is devoted to description of parts of the figure.

Heider found, however, that the observed class differences were present even in the first unit of each encoding. The argument that the two tasks (individual describing figure to tape recorder vs. the dyad interacting to solve a problem) presented quite different communication problems to the children is thus supported.

The lower-class children in Heider's study may have responded with a few WI images and then stopped talking. Middle-class children produced longer descriptions, using a greater variety of styles. In the dyadic communication situation the children were able to respond to each other, and this may account for the comparable number of units produced by each group. In this interactive situation the common task objective encouraged similar encoding strategies, i.e., presentation of a whole image as a base for reference, and subsequent attention to parts of the image, which in many cases corresponded to the critical attribute of the figures.

Summary:

The communications of child and of adult dyads performing a picture-identification task were examined for evidence of the influence of subject characteristics (age, sex, race and SES) on number of units produced or on four encoding style variables which were composed of the dimensions, part-whole and inferential-descriptive. Comparisons of procedures and results were made with a study reported by Heider (1971) which found large differences in encoding style between middle and low social-class subjects. The results produced no strong evidence of differences in encoding style on any of the subject characteristics examined. Although a slight preference for part-inferential encodings was associated with the middle-class dyads and these dyads achieved more accurate solutions to the task, this style preference could not be considered an important factor in communication accuracy. Several partial explanations of the differences in results from Heider's study are examined. It is possible that differences in encoding style are elicited in a simulated communication situation such as Heider's but do not appear under the more natural situation in which two people converse to solve a problem. In respect to the number of units produced, this explanation seems plausible since the task procedures might have been less familiar or more threatening to the lower-class children than to the middle-class children. The structure of the task itself which could have been interpreted differently by the lower and middle-class subjects may have been the source of the part-whole or inferential-descriptive style preferences in style of encoding.

Conclusions and Recommendations

The studies reported here have examined several aspects of a single type of conversational interaction, dyadic problem-solving, or convergent, communication. It has been assumed that such a type or mode is defined by the rules of conduct shared by the participants, who recognize a common purpose and jointly act to achieve it. The studies have attempted to describe this mode through an examination of the patterned regularities in speech behavior and in the structure of the communications. Future research will attempt to define and describe other types of conversational interaction and seek dimensions on which such types can be compared. It was further assumed that normal communicative competence includes the ability to distinguish and to differentiate such modes and that this ability develops over time. Thus, child and adult communication behaviors have been compared. Since communicative competence must develop within specific social settings and communication networks, the influence of such factors as social status on the structure of conversational interaction was also examined.

The first study examined the relationships among speaker function, communication mode and relative amount of participation in three problem-solving tasks. In the tasks two functions (Knower and Doer) were differentiated according to the initial distribution of information and its direction of flow. The participants adopted and executed a strategy which apportioned task activity across the two functions. It was hypothesized that in the given mode, the function of a participant would predict his TVO better than his individual tendency to talkativeness or reticence.

The TVO of one individual, alternating function over ten subtasks, was compared with that of the other individual. Adult dyads showed consistent and clear-cut distribution of TVO by participant function across all tasks. In all tasks the distribution departed from a hypothesized "balanced distribution" (Soskin & John, 1963) but not as extremely as the pattern observed in interviews (Matarazzo, et al., 1963). In the referring task, however, white adults and children departed from the Knower-dominant distribution, which all dyads preferred in the procedural

tasks. Analysis by subtask indicated that most child dyads exhibited no clear preference for distribution of participant function in the referring task. Black adults and white adults had, however, adopted very different (and within those groups) very consistent strategies which resulted in their different TVO distributions in the referring task.

By postulating a mode convention rule which was differently realized among the black and the white adult dyads, respectively, it was shown that the TVO by participant function of both groups was similarly governed. Furthermore, the contributions of the rule, of individual talkativeness and of other factors were shown to operate in much the same way across dyads in predicting TVO distribution.

No consistent SES, race or sex difference in relative participation was present among the child dyads in the procedural tasks. In the referring task there was a tendency for white child dyads to resemble the white adult pattern and black child dyads to resemble the black adult pattern of preferred strategy.

The results indicate that rules for relative participation constrain but by no means determine the behavior of speakers in a dyad. The procedures suggested here for weighing the influences of individual talkativeness, informational requirements and mode conventions in predicting relative TVO in conversation situations provide a possible means for comparing the communications of social groups whose behaviors may superficially appear to be different.

The second study investigated the frequency and patterning of repetitions, the third study examined interruptions. These phenomena have been noted as possible stylistic features of the "normal non-fluency" of natural, informal conversation (Crystal & Davy, 1969). Repetitions contribute to the considerable redundancy of dyadic problem-solving conversation; interruptions have previously been viewed as instances of the breakdown of floor apportionment mechanisms. The present studies have attempted to discover the function of these verbal gestures in the highly cooperative problem-solving interaction.

Verbatim repetition of all or part of the interlocutor's utterance was a consistent feature in all adult dyads and was somewhat more frequent

in the referring task than in the procedural tasks. Child dyads were less consistent in its use and also used less repetition in the referring task. Form of repetitions was generally varied within the subtask for all dyads, and adults and children used approximately the same proportions of the repetition categories. The most important findings here are that this verbal gesture occurred almost exclusively after the presentation of information and that the gesture itself was very frequently explicitly acknowledged. It was concluded, therefore, that repetitions are a means by which participants consolidate their store of shared information during the problem-solving communication. The gesture plays a role in the structuring of the discourse, as well, since it is one of the markers of the resolution segment of chunks (p. 8).

Interruptions were frequent in these conversations; on the average 13 out of every 100 exchanges contained one or more interruptions. The greater frequency and consistency of use of this gesture by adults suggested that interrupting might serve some purpose in the interaction. It was found that the majority of interruptions were perpetrated by the Doer in the procedural tasks. An examination of the content of the interrupting event in these tasks showed that both speakers interrupted to speed up, slow down, or assent to the pacing of the information. More than 85% of adult interruptions could be classified in this way, with the majority of these indicating an attempt to speed up the flow of information. Very few interruptions clearly indicated problems in allotting turns to speak. Only 10% of adult interruptions were of this nature. Child dyads, however, exhibited a higher percentage (21%) of interruptions which seemed to result from floor apportionment problems. Comparing interruptions in the referring task with the procedural tasks revealed a higher propoertion in the former of problems of floor apportionment for all dyads and especially for child dyads. This would suggest that the less distinct the participant functions are in a conversation, the more frequent would be interruptions used for getting or keeping the floor.

The results of these three studies of verbal interaction are consonant with the previous work of this project which described the organization of the problem-solving communications. The mechanisms here described underlie

highly cooperative, highly integrated activity. The consistency of adult behavior and the similar, though less consistent, behavior of the children suggest that the complex conventions which underlie normal conversation are acquired gradually. Subtle adaptation of these conventions to specific task requirements, i.e., referring vs. procedural tasks, is evident, particularly among adults. It seems likely that skills in structuring the flow of information and controlling its pacing can only be learned in the context of connected discourse and by virtue of experience with different discourse varieties. Furthermore, we have indicated several skills which relate primarily to spoken discourse.

Several implications of these findings for educational practice can be suggested. At least through the secondary school level, children are still in the process of acquiring the skills characteristic of adult problem-solving communication. (This statement appears to be true of all the child dyads in the present sample, for no consistent SES, race or sex differences were noted in the features of communication structure examined.) Since doing (and learning) often requires that people interact to achieve a goal or solution, it seems reasonable to suggest that skill in problem-oriented conversation should be actively encouraged.

Children should be given the opportunity, whether by means of modeling or by means of guided practice, to acquire facility in this type of interaction, which occurs in a broad range of real-life situations. What is recommended, then, is a diversity of experience in realistic interaction situations in which information must be exchanged. In such situations the child would be encouraged to perform, not as passive recipient of information, but as an active participant in the process of structuring a task and cooperatively pursuing a solution or goal. Examples of practical tasks might be: 1) directing (by telephone) a delivery man to the student's residence, 2) trying to identify some component of a machine or piece of equipment to a parts clerk, and 3) discussing (by telephone) a third party's condition or symptoms with a doctor, where the goal is to arrive at emergency treatment. Alternating in the performance of both functions in a given task would reveal to the student how the information is complementarily distributed between the participants.

By examining the cognitive and interactional requirements of speech situations, further varieties (other than procedural and referring) of problem-solving communication can probably be identified and representative practice tasks developed. Also, children might be given the opportunity to perform the less accustomed role in the familiar modes of the interview or interrogation. The function of interviewer, for example, requires quite different skills than does the function of interviewee in respect to organizing and structuring the communication.

Similar recommendations for foreign language instruction are implied by these studies and may be tentatively suggested. Conventions for structuring and integrating conversational interaction can be acquired only in realistic speech situations. Language-specific rules governing the variants of ellipsis types, substitution sets and anaphoric relations, topicalization, hesitation forms, etc., can best be learned in situations in which these features appear in their normal functions, i.e., as elements of the structure of connected discourse. For example, the correct forms of the foreign language equivalents for chunk initial highlighting of the chunk theme will rarely result from a literal translation from English. (Some examples of highlighting, or foregrounding, from the corpus are: "As to its color, it's blue-green." or "What about the head, does it have one or two antenna on the head?" or "Okay...this ostrich now...it has a beret on.") Each language has specialized means by which the theme of a chunk is established. These means (as well as the other means by which discourse is organized) may differ in spoken and written forms of the language and from formal to informal speech. It is not likely that such forms will appear or can be learned out of context. However, since the contrastive analysis of discourse types has been devoted primarily to written texts or to single speaker forms of speech (e.g., narratives), considerable preliminary research will be required to identify the features essential to the organization of conversational modes and to contrast these across languages.

The fourth study examined dimensions of the encoding style used by children and adults in the referring task. In contrast to a previous study by Heider (1971),who found consistent differences in encoding style across

children of different social classes, all child dyads used approximately similar proportions of the style variables. Also, child and adult dyads were quite similar in respect to the five measures of style. It was not possible to discover any relationship between encoding style and accuracy in task solution which might have accounted for the higher accuracy scores achieved by middle-class and white dyads in this particular task (Baldwin & Garvey, 1970). It is possible, as Heider suggests, that the encoding units of middle-class subjects may have been more "informationally relevant" (Heider, op. cit., p. 44), that is, that the units may have contained more unambiguous or more essential information.

The discrepancy in results between the present study and Heider's experiment could not be precisely identified. It was suggested, however, that the principle sources of the discrepancy were the different interactional and cognitive characteristics of the communication tasks. In respect to the number of units produced, the situation in which members of a dyad converse freely is more natural and is probably less likely to depress the performance of lower-class children. This conclusion is supported by a number of studies reviewed by Cazden (1970) and by Labov's observations (1968) of the fluency of lower-class speech in relatively unconstrained situations. In respect to the proportions of images of different stylistic types, the particular structure of the referring task encourages speakers to move from a description of the whole figure to a part-by-part description of the critical attributes of the figure. Members of the dyad, who were free to question, comment and respond, encouraged one another to more extensive description of the figure. If such factors can influence the relative performance of children of different social classes, then we must suggest that the results of studies demonstrating social-class differences in speech behavior be interpreted only with great caution. In addition to factors generally considered (e.g., race and SES of experimenter, familiarity of task materials or the dialect used stimuli or for instructions, etc.), the interaction requirements and their specific relationship to the elements of the task may encourage or suppress the appearance of social-class differences in speech performance.

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Appendix

Task I stimuli	66
Task II stimuli	71
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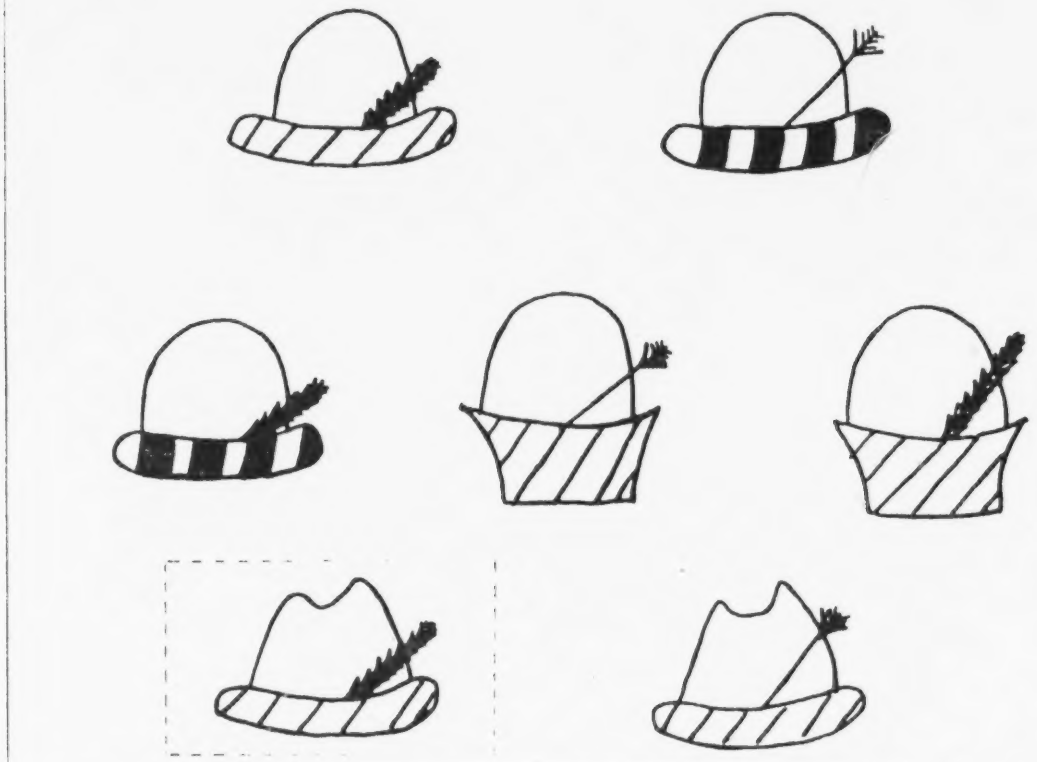
Stimuli used in Heider (1971) study	73

Task 1

Subtask 1



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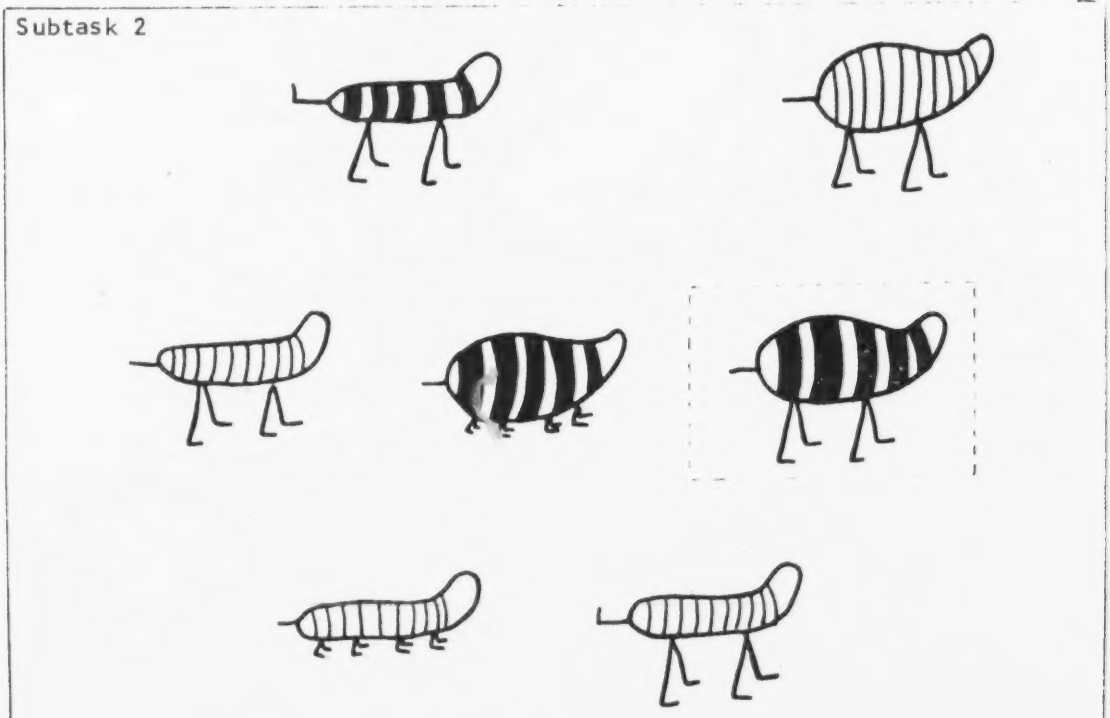
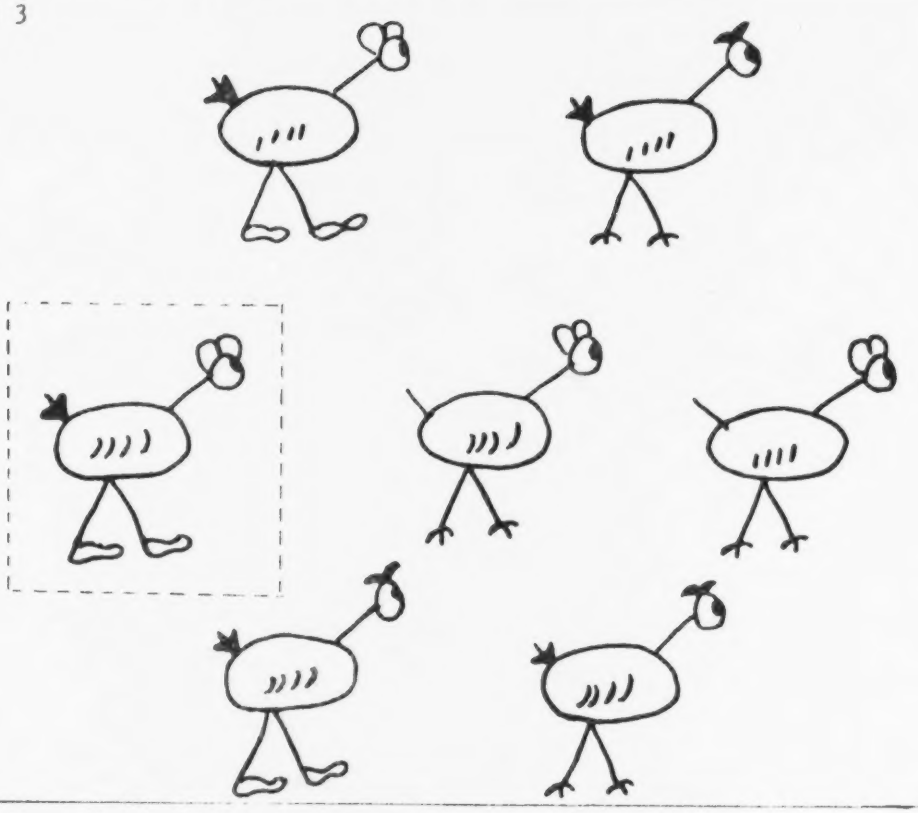
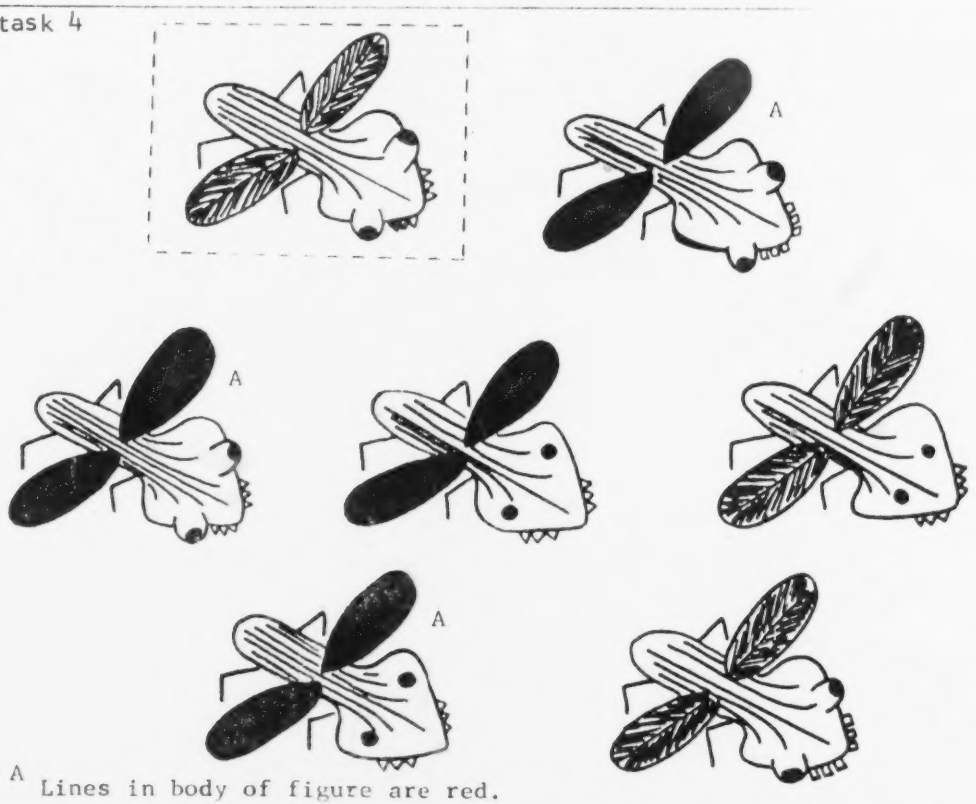


Task 1

Subtask 3



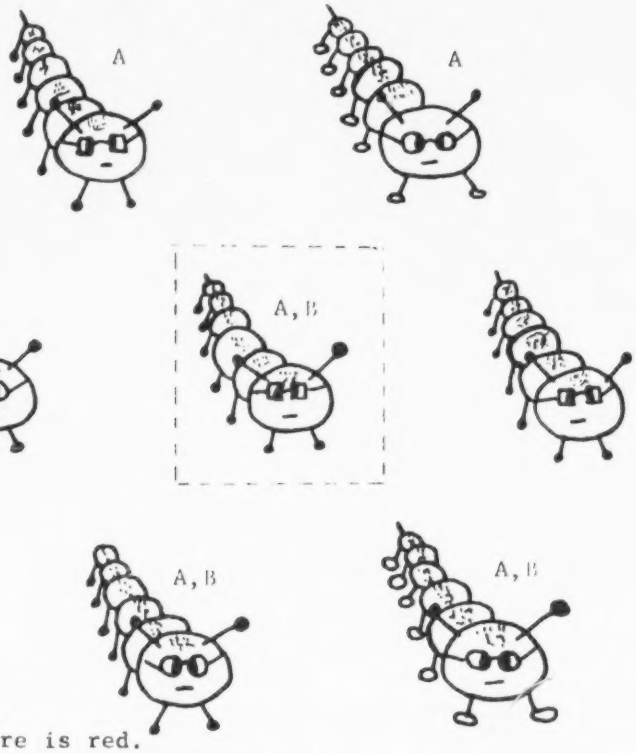
Subtask 4



A Lines in body of figure are red.

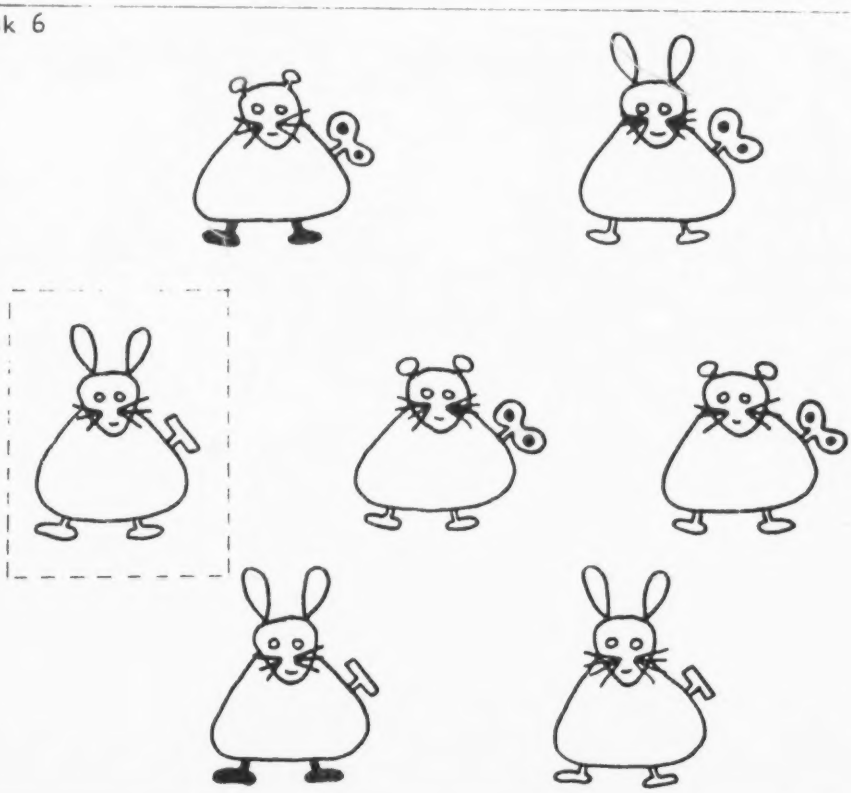
Task I

Subtask 5



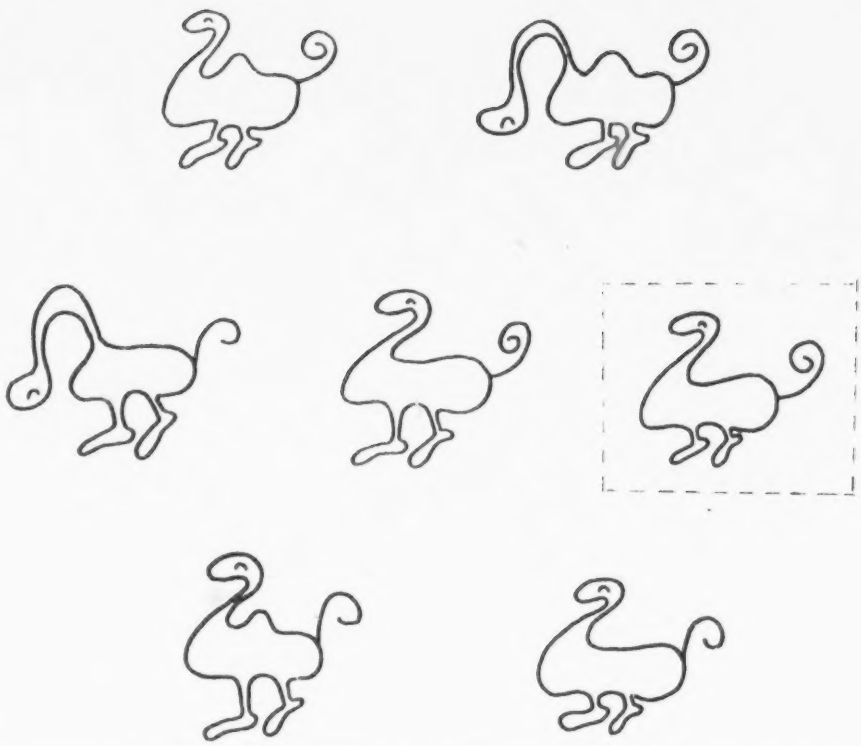
A Fuzz on figure is red.
B Tips of antennae of figure are red.

Subtask 6

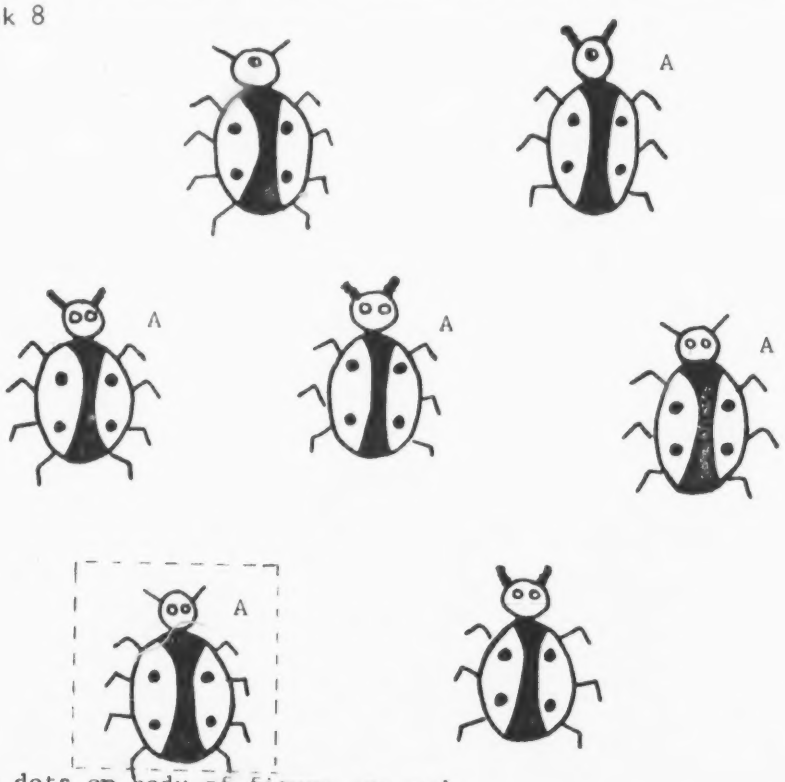


Task I

Subtask 7



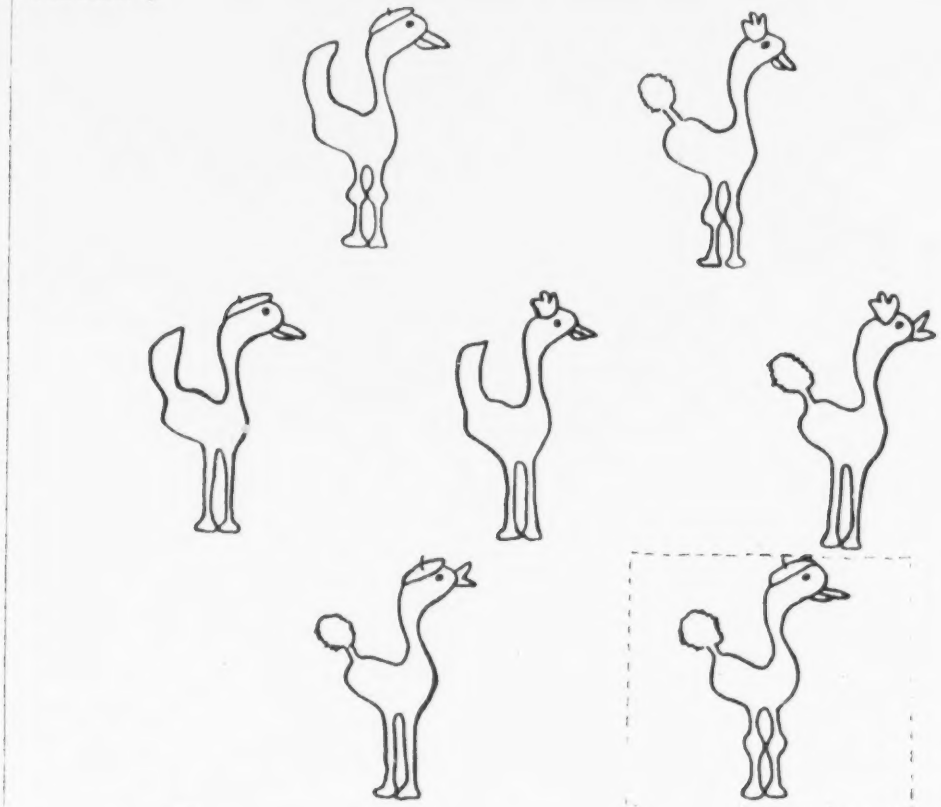
Subtask 8



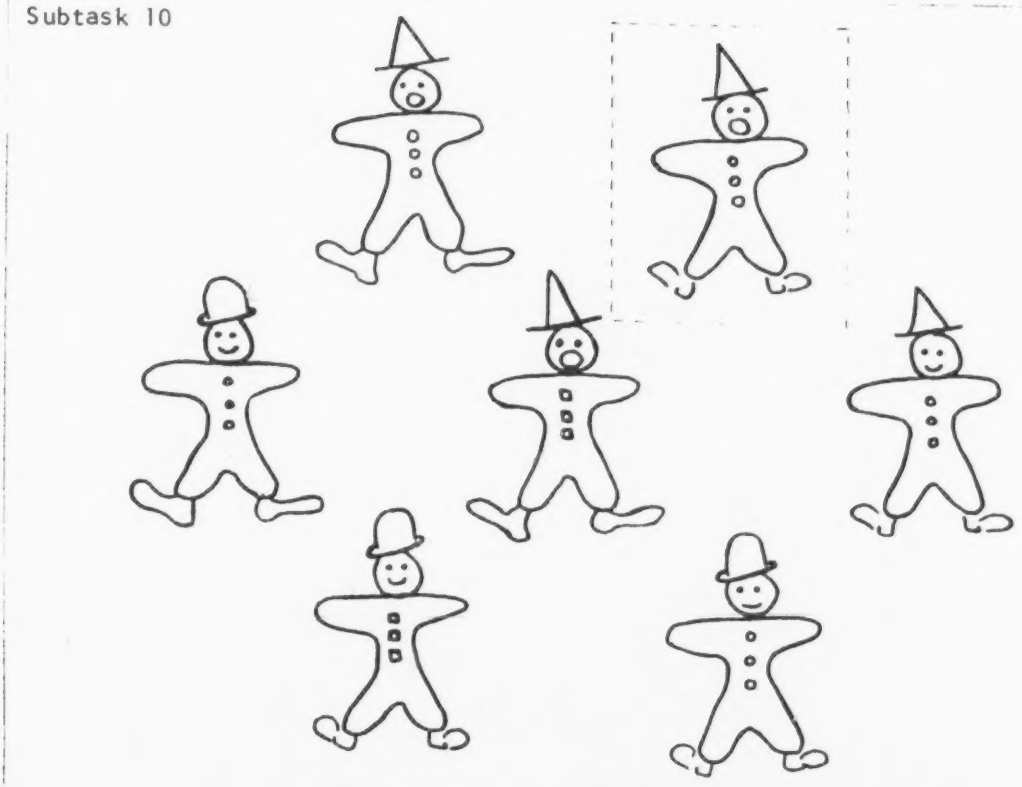
A Four dots on body of figure are red.

Task 1

Subtask 9



Subtask 10

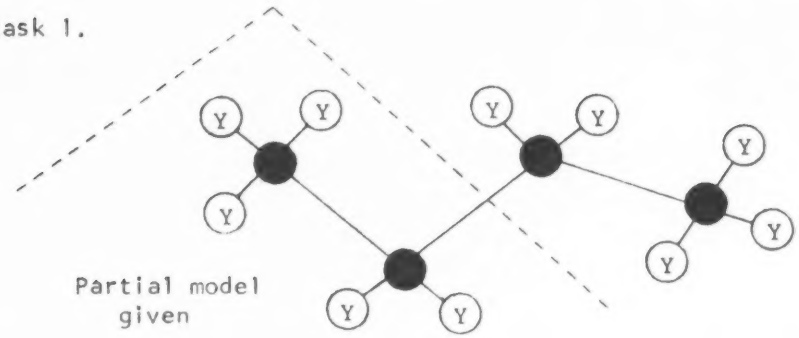


Task II

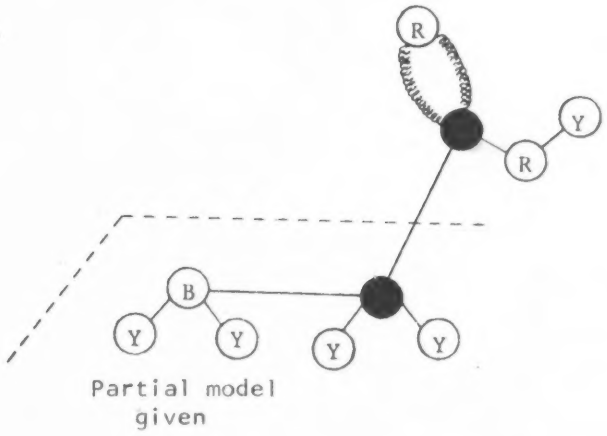
Constructed Models:

The letters inside each ball are the initial letters of the following colors: blue, red, and yellow, representing the actual colors used. Filled in balls are black.

Subtask 1.

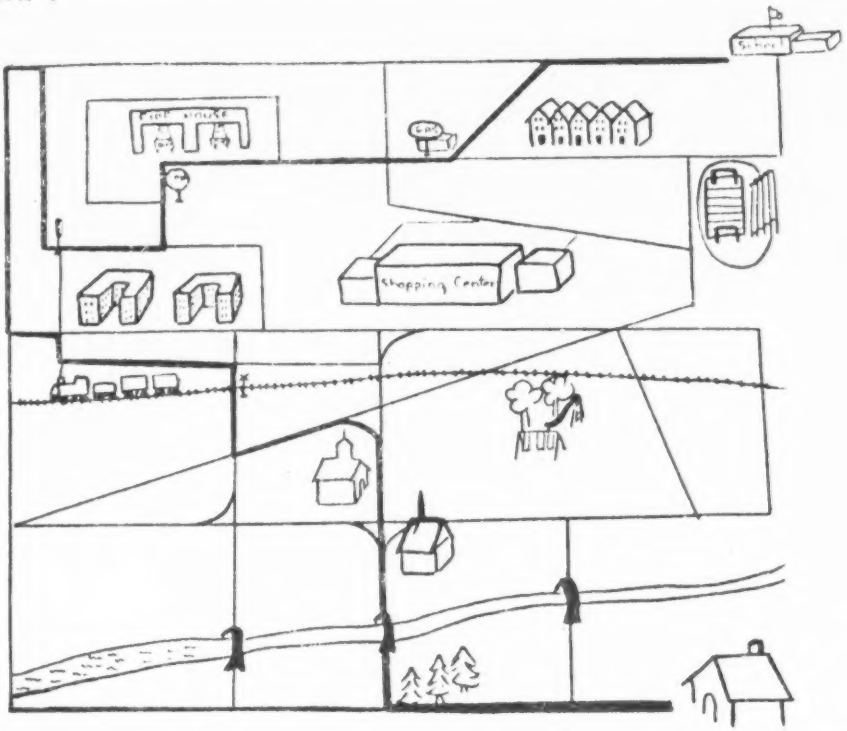


Subtask 2.

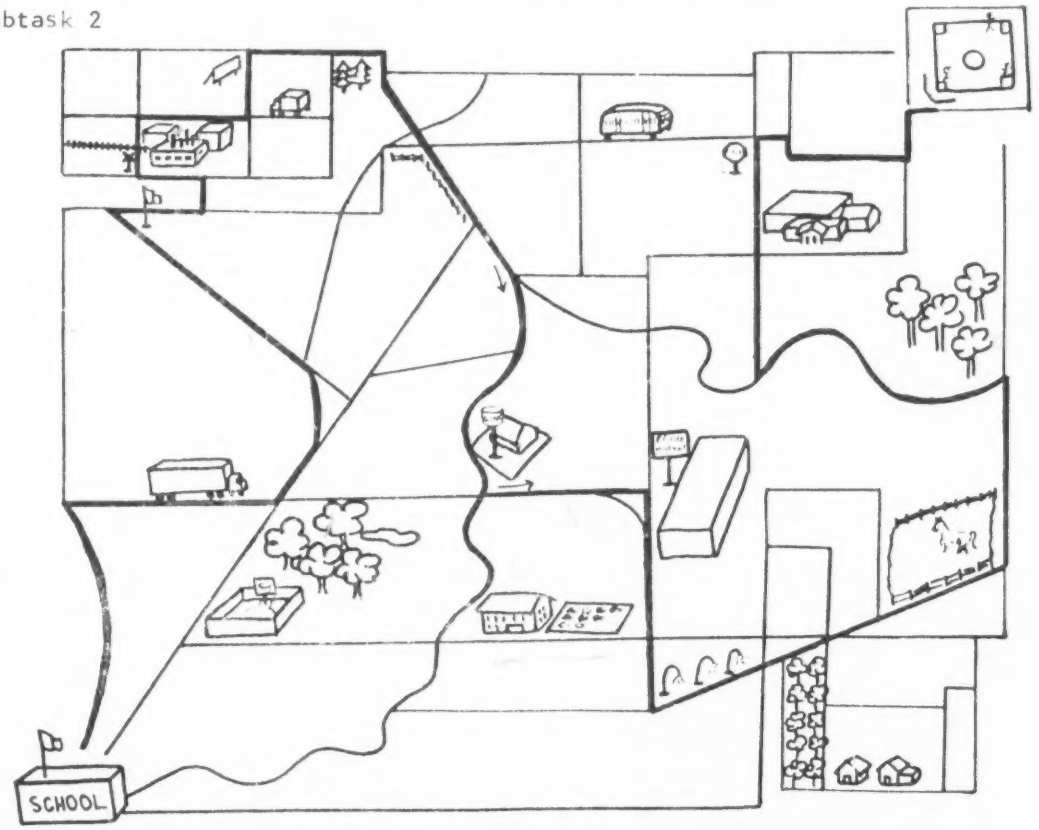


Task III (with complete route--Knower's version)

Subtask 1



Subtask 2



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